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# EPIDEMIC MYALGIA, OR PLEURODYNIA

## CLINICAL AND BACTERIOLOGIC STUDIES

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CINCINNATI

Epidemic myalgia, or pleurodynia, while recognized by Finsen in Iceland in 1856, was first reported in 1874.[1] Its first description in the American medical literature was by Dabney[2] in 1888. Numerous epidemics have been reported in the foreign medical literature, particularly in the Scandinavian countries. In the United States epidemics have occurred chiefly in the eastern and the southern states. The disease has been designated epidemic muscular rheumatism,[3] Bornholm disease,[4] epidemic myositis,[5] Sylvest-Bing's disease,[6] epidemic pleurodynia[7] and epidemic myalgia.[7] In the lay press it is commonly referred to as devil's grip. Descriptions of the clinical course of the disease vary little in their essentials; they were summarized in an editorial in *The Journal of the American Medical Association* in 1934.[7]

Reports of the bacteriologic observations in this disease have been inconclusive. Attlee, Amsler and Beaumont[8] in an epidemic in Eton

From the Children's Hospital Research Foundation and the Department of Pediatrics, College of Medicine, University of Cincinnati.

1. Finsen, Jon: Iagtagelser angaaende sygdomsforholdene i Island, Copenhagen, C. A. Reitzel, Publisher, 1874.

2. Dabney, W. C.: Account of an Epidemic Resembling Dengue, Which Occurred in and Around Charlottesville and the University of Virginia in June 1888, Am. J. M. Sc. **96**:488, 1888.

3. Daae, A.: Epidemi i Drangedal af akut muskelreumatisme udbredt ved smitte, Norsk mag. f. lægevidensk. **2**:408 and 529, 1872.

4. Sylvest, Ejnar: Den Bornholmske syge: Myalgis epidemica, Copenhagen, Levin & Munksgaard, 1933.

5. Hansen, N.: Epidemic Myositis, Ugesk. f. læger **92**:842, 1930.

6. Dalsgaard-Nielsen, T.: Pericarditis in Sylvest-Bings Disease (Acute Epidemic Myositis), Ugesk. f. læger **95**:522, 1933.

7. Epidemic Myalgia or Pleurodynia, editorial, J. A. M. A. **102**:460 (Feb. 10) 1934.

8. Attlee, W.; Amsler, A. M., and Beaumont, D. C.: Epidemic Pleurisy, Lancet **2**:492, 1924.

College among forty-eight boys from 14 to 18 years of age found in the throats "some colonies of staphylococcus aureus and a free growth of streptococci." Wood [9] in a large number of cases reported negative blood cultures and negative agglutination tests for Bacillus typhosus and Bacillus paratyphosus A and B. He stated that "smears from throats showed only organisms normally present." Churchill, Landis and Glusker [10] reported "An Epidemic of Undetermined Origin: Dengue?" There were fifty cases, and in eleven a culture of material from the throat showed only the ordinary oral bacteria.

### STUDIES OF THE CINCINNATI EPIDEMIC OF 1935

In the first week of July 1935 several patients complaining of abdominal pain and fever were referred to the Children's Hospital with a diagnosis of acute appendicitis. These children did not present conclusive evidence of such a condition, and it was suspected that they might be suffering from epidemic myalgia. During the next week the increasing number of children coming into the hospital with the same symptoms and the prompt recovery of the initial patients made this diagnosis possible, and the physicians of the community were informed of the presence of such an epidemic. During the months of July, August, September and October two hundred and eighty-two cases of the condition in patients of all ages were reported to the local department of public health. This epidemic has been recorded by Harder.[11] The clinical and bacteriologic observations on the seventy children studied in the Children's Hospital are reported here. Eighteen children with the disease were admitted to the children's wards of the Cincinnati General Hospital, but their cases are not included in this report, although the clinical findings were similar.

### CLINICAL STUDIES

The characteristic picture of the disease, as seen in this epidemic, was similar to that previously described and may be summarized as follows:

*Onset.*—The onset was usually abrupt. A few patients complained of malaise before the onset of pain, but in the majority pain was the initial and outstanding symptom. The onset was accompanied by nausea in 35 per cent of the patients and by vomiting in 31 per cent. Thirteen per cent were said to have had chills accompanying the onset of pain, although we were never able to observe this symptom directly.

9. Wood, R. B.: An Epidemic of Acute Pleurodynia in Tennessee, J. Tennessee M. A. **18**:255 (Jan.) 1926.

10. Churchill, F. S.; Landis, E. M., and Glusker, S. D.: An Epidemic of Undetermined Nature: Dengue (?), J. A. M. A. **87**:821 (Sept. 11) 1926.

11. Harder, F. K.: Epidemic Myalgia or Pleurodynia in Southwestern Ohio, Am. J. M. Sc. **191**:678, 1936.

*Pain.*—As has been noted, pain was the initial and outstanding symptom. It usually preceded the rise in temperature by an hour or more and did not disappear until after the temperature had returned to normal. The pain was sudden and was usually located in the lower part of the chest or the upper part of the abdomen or in both places. In forty-one (58 per cent) of our patients pain was referred to the abdomen alone, and in fourteen (20 per cent) there were pains in both the abdomen and the chest. In seven patients (10 per cent) the pain was confined to the chest. The remaining eight patients (11 per cent) had indefinite pain but are included in this series because of other clinical features. The pain was usually knifelike and colicky and aggravated by deep breathing and by movements of the body. As a rule the pain that accompanied the recurrence of fever was less severe than that of the initial attack. It was possible to demonstrate tenderness over the site of the pain in the chest in five patients. Three patients exhibited limitation of motion of the chest on the affected side. Abnormal physical signs such as impaired resonance, constant râles or friction rubs were not found in any of the patients. Roentgenograms of the chest for forty patients failed to reveal any significant abnormalities. Fluoroscopy of the chest was performed on six patients. In one of these, who complained of pain in the right, lower part of the chest at the time of the examination, there was limitation of the diaphragmatic excursion on that side. The other patients studied under the fluoroscope were free from symptoms at the time of the examination and exhibited no abnormalities. In most of the patients abdominal tenderness was generalized or in the upper part of the abdomen. Only 10 per cent had definite tenderness in the right lower quadrant. Voluntary spasm of the abdominal muscles was noted in almost all patients complaining of abdominal pain. Firmness of these muscles was noted frequently, but we were unable to observe any such swelling of the affected muscles as that described by Sylvest.[4]

*Fever.*—Each of our seventy patients had a definite history of fever; sixty-four had a temperature above 99.6 F. per rectum while in the hospital, and fifty-three of these (76 per cent), a temperature between 101 and 105 F. As has been noted, the fever and pain were closely associated. Within from six to twelve hours the fever usually fell to normal or subnormal, and with this fall the patient became comfortable and the pain subsided. Thirteen of our patients (19 per cent) had a secondary rise of temperature on the third or fourth day, with a recurrence of pain. In a few patients fever and pain reappeared on the sixth or seventh and again on the eighth or ninth day. A typical temperature chart for a patient with recurrent pain is shown in figure 1.

It is evident from the analysis in table 1 that in this epidemic most of the patients were not referred to the hospital on the first day of illness. The data on the recurrence of pain and fever, therefore, depend largely on the history. However, most of our patients had at least one such episode. Of the eleven patients seen on the first day of illness, four had a recurrence of pain and fever on the third or fourth day. Many of the patients were probably seen in the hospital in their second or third recurrence, since 65 per cent of them were seen on the second, third or fourth day of their illness and since all gave a history of severe pain that had subsided and recurred.

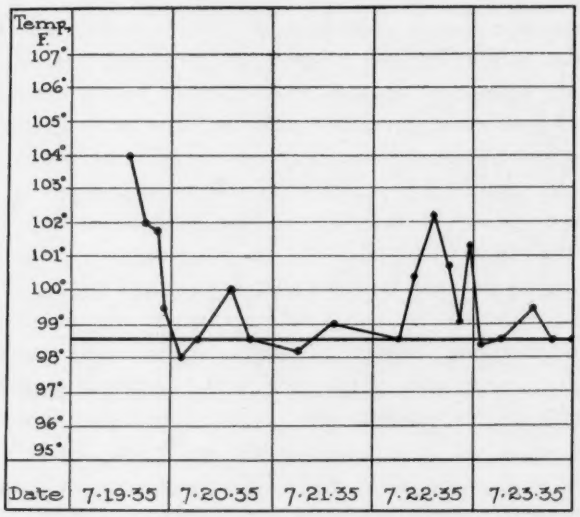


Fig. 1.—A typical temperature curve for a patient with recurrence of fever and pain.

The duration of fever in the hospital was from one to nine days, with an average of from one to three days. The total duration of the illness varied from two to seventeen days, with an average of from four to six days.

*Pulse and Respirations.*—The pulse and respiratory rates paralleled the temperature curves. With the rise in temperature the pulse rate reached peaks of from 150 to 160 and the respiratory rate of from 35 to 40 per minute. The pulse was rapid but full; the respirations were often grunting. Dyspnea was noted in forty-two patients (60 per cent).

*Other Symptoms.*—Malaise was noted in 80 per cent of the patients, usually accompanying the pain, generalized dull headache in 42 per cent, constipation in 36 per cent and sore throat in 15 per cent. Nasal dis-

charge was never a prominent sign, but it was noted in 25 per cent. Twenty-five per cent exhibited hyperemia of the pharynx.

*Laboratory Data.*—Urinalyses and tuberculin and Wassermann tests, done for all patients, failed to show any abnormalities related to pleurodynia. Fourteen lumbar punctures were done, and normal spinal fluid was obtained.

Examinations of the blood were made for all patients at the time of their admission to the hospital. The hemoglobin values and the erythrocyte counts did not vary from the normal. Malarial plasmodia were searched for carefully but were never found. The data concerning the initial leukocyte count are recorded in figure 2. In addition, in table 2 are given the data for one patient for whom the leukocytes were studied on subsequent days. There appeared to be a definite tendency toward leukopenia from the second to the fifth day. There was no apparent

TABLE 1.—*Analyses of the Duration of the Disease Before the Patient's Admission to the Hospital*

| Day Before Admission | Number of Cases | Percentage |
|---|---|---|
| 1st | 10 | 14 |
| 2d | 13 | 19 |
| 3d | 17 | 24 |
| 4th | 16 | 23 |
| 5th | 8 | 11 |
| 6th | 1 | 1 |
| 8th | 5 | 7 |
| Total | 70 | |

elevation of the total white count during the recurrent attacks of pain and fever. Our data do not support the statement made in the editorial in *The Journal of the American Medical Association*[7] that "the only change in blood is leukocytosis (with many eosinophils) in convalescence." The differential blood counts of these patients demonstrated no striking abnormalities. The average analysis showed the presence of from 60 to 80 per cent of polymorphonuclear neutrophils. The number of lymphocytes varied from 20 to 30 per cent. Eosinophil counts of over 5 per cent were noted during convalescence in only two cases.

*Age and Sex.*—The distribution of our patients according to age and sex is given in table 3.

*Treatment.*—Medication was found to have little effect on the course of the disease. Salicylates apparently had some value in diminishing the intensity of the pain but did not alter the temperature curves. Liquid or semiliquid diets were taken well. Constipation and abdominal distention were relieved by enemas.

*Sequelae.*—The patients were followed in the outpatient clinic of the hospital for ten months. No sequelae that might be attributed to pleurodynia were observed.

BACTERIOLOGIC STUDIES

Of the seventy patients, twenty-six were studied bacteriologically. The material for culture consisted of blood from twenty-three patients, spinal fluid from three, swabs from the throat from twenty-two, nasal washings from eight, Seitz filtrates of nasal washings from two and stools from eleven.

*Blood Cultures.*—A total of twenty-five blood cultures were obtained from twenty-three of the seventy patients. Of these, seven-

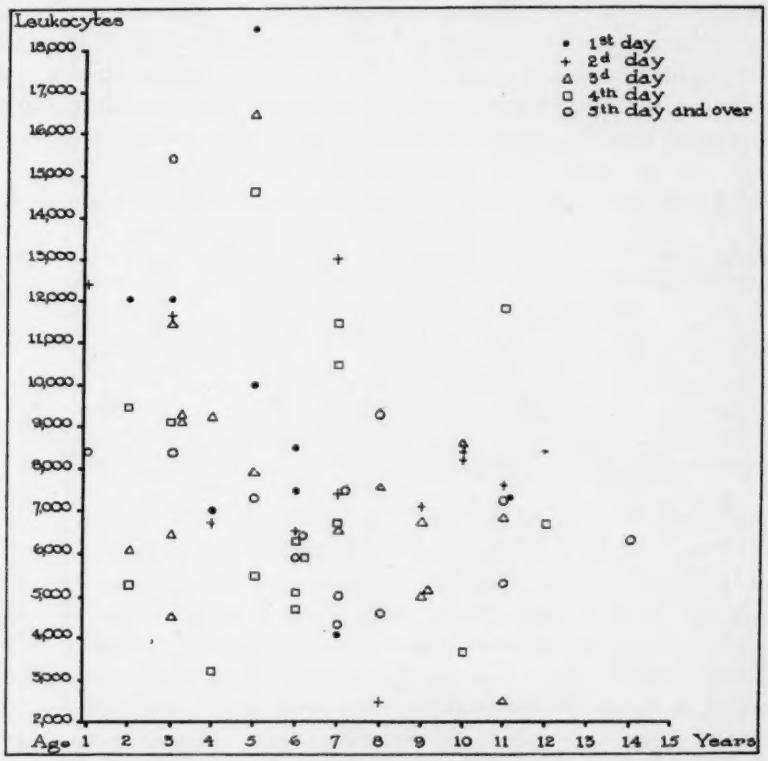


Fig. 2.—The total white cell count on admission recorded for different ages. The symbols for the different days indicate the day of the disease.

teen were secured from fifteen of the twenty-six patients who were otherwise studied bacteriologically. An attempt was made to obtain at least 20 cc. of blood for each culture. It was immediately cultured in various mediums under different oxygen tensions. Portions of each specimen of blood were cultured in anaerobic Spray Petri dishes with bactonutrient agar, $p_H$ 7.3, in tall deep tubes of brain broth (bactonutrient broth, $p_H$ 7.4, plus fresh, finely ground calves' brains to a depth of 1 inch [2.5 cm.]) and in deep tubes of semisolid agar (bactonutrient broth

plus 0.1 per cent agar). All cultures remained negative for at least six weeks. Three cubic centimeters of blood from one patient a culture of which was negative was injected intraperitoneally into a rabbit. The rabbit remained apparently normal.

*Spinal Fluid.*—Spinal fluid from three patients was cultured in blood-dextrose-brain broth and plain brain broth (Difco). The blood-

TABLE 2.—*Total White Cell Count and Differential Count for Patient Who Had Repeated Examinations of the Blood*

| Day Before Admission | White Cells | Polymorphonuclears, Percentage | Lymphocytes, Percentage | Monocytes, Percentage | Eosinophils, Percentage | Temperature, F. |
|---|---|---|---|---|---|---|
| 4th | 10,250 | 82 | 16 | 2 | .. | 101.6 |
| 5th | 3,000 | .. | .. | .. | .. | N |
| 6th | 3,500 | 48 | 50 | 2 | .. | N |
| 3d | 4,100 | 69 | 27 | 4 | .. | 103 |
| 7th | 3,500 | .. | .. | .. | .. | N |
| 1st | 12,000 | | | | | |
| 12 hr. later (at admission) | 9,900 | | | | | |
| After Admission | | | | | | |
| 24 hours | 8,300 | | | | | |
| 3d | 7,600 | 88 | 11 | 1 | .. | 103 |
| 5th | 4,650 | .. | .. | .. | .. | N |
| 4th | 11,800 | 76 | .. | .. | .. | 102 |
| 5th | 9,700 | 74 | 23 | 2 | 1 | N |
| 2d | 2,550 | 45 | 42 | 10 | 2 | 99.6 |
| 6th | 6,800 | 54 | 38 | 6 | 2 | N |
| 2d | 7,400 | 56 | 35 | 8 | 1 | 101 |
| 4th | 5,700 | .. | .. | .. | .. | 101 |
| 4th | 11,450 | 56 | 35 | 6 | 2 | N |
| 5th | 9,100 | Differential data practically the same | | | | 103 |
| 3d | 5,100 | 72 | 22 | 6 | .. | 102.4 |
| 5th | 2,800 | 82 | 6 | 12 | .. | 102 |
| 5th | 2,900 | 82 | 9 | 6 | .. | 102 |
| 6th | 9,700 | 32.5 | 60.3 | 3 | 4 | 104 |

TABLE 3.—*Distribution of Patients in Regard to Age and Sex*

| | Total | Sex | |
|---|---|---|---|
| | | Male | Female |
| 1 year or under | 2 | 1 | 1 |
| 2- 4 years | 19 | 11 | 8 |
| 5- 7 years | 27 | 11 | 16 |
| 8-15 years | 22 | 14 | 8 |
| | 70 | 37 | 33 |

dextrose-brain broth medium contained 5 per cent of fresh citrated whole blood of rabbits and 1 per cent of dextrose. The quantities cultured were as follows: 1.5 cc. from patient V. H., 4 cc. from patient W. J. L. and 4 cc. from patient D. B. All cultures remained negative during five weeks' incubation. The spinal fluid from W. J. L. was normal as to pressure, appearance, globulin and cell count. The spinal fluid from D. B. was under slightly increased pressure but was other-

wise normal. The spinal fluid from V. H. had a cell count of 2 mononuclear leukocytes and was otherwise normal.

*Cultures of Material from the Throat.*—Bacteriologic studies were made on cultures of material from the throats of twenty-two patients. Material for culture was obtained from high in the posterior pharyngeal space by a thorough swabbing of this area with a sterile applicator. The material was cultured immediately in large tubes of brain broth and on the surface of blood agar plates, 5 per cent of rabbits' blood being used. Table 4 shows the incidence of the different bacteria found. A green-producing, slightly hemolytic streptococcus, growing in very small colonies, was the only micro-organism found consistently.

*Nasal Washings.*—Bacteriologic studies of nasal washings from eight patients revealed the same varieties of bacteria as were found in the cultures of material from the throats. The only organism common

TABLE 4.—*Incidence of Various Types of Bacteria in Cultures of Material from the Throats of Twenty-Two Patients*

| Type of Bacteria | No. of Patients |
|---|---|
| Tiny-colony, green-producing, slightly hemolytic streptococci | 22 |
| Gram-negative diplococci | 15 |
| Bacillus influenzae | 7 |
| Staphylococci | 7 |
| Gram-positive micrococci, large | 7 |
| Slightly hemolytic gram-negative bacilli (not B. influenzae) | 3 |
| Diphtheroid bacilli | 2 |
| Hemolytic streptococci | 2 |

to all the washings was the tiny colony, green-producing, slightly hemolytic streptococcus.

Bacteriologic studies of Seitz filtrates of nasal washings gave negative results.

*Studies of Stools.*—Stools from eleven patients were studied bacteriologically. All specimens contained Bacillus coli, six contained Streptococcus faecalis and five contained Bacillus lactis-aerogenes.

*Animal Injection Experiments.*—The results of injection into animals of material and cultures will be reported in detail in another publication. Only the original brain broth cultures of material from the throat caused illness and death in rabbits. The lungs of these rabbits showed congestion, edema, hemorrhage into the alveoli and acute cellular reaction. Two monkeys inoculated intracerebrally and intraperitoneally with nasal washings died, and the lungs showed extensive congestion. With both the rabbits and the monkeys the tiny colony, green-producing streptococcus, was the only organism recovered at necropsy. Injection of Seitz filtrates of nasal washings from two patients into two rabbits resulted in both instances in febrile reactions on the tenth and eleventh days after injection. Although this suggests the presence

of a filtrable virus, further intensive studies are needed before any conclusion can be drawn.

## COMMENT

Epidemic myalgia, like anterior poliomyelitis, usually occurs during the summer. Most investigators believe that the disease is only mildly contagious and that transmission is directly through the secretions of the nose and throat. The patients studied were admitted to the general wards of the hospital. They were placed in individual glass-enclosed cubicles, and gowns and masks were worn by attending physicians and nurses. No instances of cross-infection occurred.

The diagnosis of the disease rests primarily on the occurrence of pain and fever, the absence of physical signs to account for the symptoms, the tendency to recurrence of fever and symptoms and the quick recovery without sequelae. Diagnosis is difficult except in the presence of an epidemic. The disease in children is most frequently confused with acute appendicitis, early pneumonia or pleurisy and in adults with acute cholecystitis, influenza or coronary occlusion. Differentiation is based on the colicky, knifelike character of the pain, the absence, usually, of localized tenderness in the right, lower part of the abdomen, the absence of involuntary spasms of the muscles in most cases and the relatively low leukocyte count.

Although the widespread incidence of this disease in epidemic proportions points to the fact that an acute infectious agent may play an etiologic rôle, the consistently negative blood cultures appear to rule out gross bacteremia or septicemia, and the negative spinal fluid cultures tend to rule out gross pyogenic invasion of the central nervous system.

Bacteriologic studies of cultures of material from the throat and of nasal washings revealed various types of bacteria. A green-producing, slightly hemolytic streptococcus growing in tiny colonies was the only micro-organism observed consistently in the cultures from each of the patients studied.

This epidemic of pleurodynia in Cincinnati occurred during the same period as an epidemic of benign lymphocytic meningitis reported from the department of pediatrics of the University of Cincinnati College of Medicine by Dummer, Lyon and Stevenson.[12] This may be coincidence, but the fact that the causative agent in both conditions is unknown and that both end in complete recovery suggest the possibility that the two conditions may have a common causative agent, which happens to affect in one case the central nervous system and in the other the peripheral nervous system.

12. Dummer, C.: Lyon, R. A., and Stevenson, F. E.: Benign Lymphocytic Meningitis (Aseptic Meningitis), J. A. M. A. **108**:633 (Feb. 20) 1937.

## CONCLUSIONS

Seventy patients with epidemic myalgia were studied.

The outstanding symptoms were pain, most frequently abdominal, and fever, the onset of both being sudden.

Twenty-six of the seventy patients were studied bacteriologically. Twenty-five blood cultures, from twenty-three patients, remained negative for at least six weeks. Spinal fluid cultures from three patients also remained negative.

Cultures of material from the throats of twenty-two patients revealed a variety of bacteria. The only micro-organism found consistently was a green-producing, slightly hemolytic streptococcus, which grew in tiny colonies.

Bacteriologic studies of nasal washings from eight patients revealed practically the same variety of bacteria as was found in the cultures of material from the throats.

Injection experiments with animals are to be reported in detail in a later paper.

# SALICYLATE POISONING: AN EXPLANATION OF THE MORE SERIOUS MANIFESTATIONS

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The numerous reports in the literature of poisoning due to salicylates apart from manifestations of an allergic idiosyncrasy to the drug indicate that salicyl compounds are not always the harmless household remedy that they are generally supposed to be. The ingestion of large amounts of salicylates by children accidentally or by adults with suicidal intent account for the majority of the reported instances of poisoning. Occasionally, however, intoxication results from intensive therapeutic use of the drug.

The typical picture of salicylate intoxication has been described by many authors. A most common symptom is rapid, deep respiration. There are usually vomiting, extreme thirst, profuse sweating, moderate or high fever, mental confusion or delirium and sometimes convulsions. Late in severe poisoning there may be cyanosis, respiratory and cardiac failure, coma and death. There is often polyuria at first, with scanty urine or anuria as the intoxication develops. The urine reduces copper solutions, thus giving an apparent but falsely positive reaction for sugar. A strongly positive reaction to ferric chloride persists after the urine is boiled and is due to the presence of the salicyl group. Acetone may or may not be present. Albumin is frequently present, and there may be casts and red and white blood cells. The reaction of the urine has been reported as more acid or more alkaline than normal at different stages of the intoxication. The carbon dioxide-combining power of the blood is often reduced. At postmortem examination, marked congestion, edema and petechial hemorrhage of the gastro-intestinal mucosa and of the pericardial, pleural and subdural spaces indicate capillary injury. There are degenerative changes in the liver and kidneys.

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This work was aided by a grant from the division of medical sciences of the Rockefeller Foundation.

From the departments of pediatrics of Vanderbilt University Medical School and Duke University School of Medicine.

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Our interest in the danger of salicylates was aroused by the observation of three children, one poisoned with methyl salicylate and two with acetylsalicylic acid.

CASE 1.—A white girl aged 22 months entered the Duke Hospital on April 30, 1935, because of vomiting and "hard breathing." The day previous to admission an older brother had given the child some fluid to drink from a small bottle. The bottle, which was brought in by the parents, had a strong odor of methyl salicylate. The liquid had burned the child's mouth and had made her cough. Soon afterward she had become nauseated and had vomited several times. Later that evening the parents noticed that her respirations were rapid and forceful. She slept little, and the next day the respiratory distress was unchanged. She took fluids poorly and refused all solid food. By evening the respiratory distress had become so alarming that the child was brought to the hospital. She was greatly dehydrated. Her temperature was 100 F., her pulse rate 122 and her respiratory rate 34 per minute. Her breathing was deep, and there was an expiratory grunt. The breath had a strong odor of acetone. The buccal and pharyngeal mucous membranes were dry and injected. On the night of admission the carbon-dioxide combining power of the blood was 14.7 volumes per cent. The urine contained a trace of albumin, much acetone and diacetic acid and large amounts of salicylates.

Because of the low carbon dioxide-combining power of the blood the child was immediately given 300 cc. of a sixth-molar solution of sodium lactate intravenously and 250 cc. subcutaneously. Dextrose solution and orange juice were given by mouth. The next morning the carbon dioxide-combining power of the blood was 24 volumes per cent. The temperature was 102.5 F. The respiratory distress was somewhat improved. Since the child was still dehydrated, the administration of fluids not only by mouth but also parenterally was continued. By evening the carbon dioxide-combining power had reached 51 volumes per cent. Other chemical findings for the blood at that time were: $p_H$ 7.33 and nonprotein nitrogen 38 mg. and sugar 118 mg. per hundred cubic centimeters. On the third day the child was much improved. She was more alert and took enormous amounts of fluid. By the fourth day the temperature, the respiratory rate and the urine were normal. The child was discharged soon afterward in good condition.

CASE 2.—A white boy aged 7 months was brought to the Vanderbilt University Hospital on Jan. 25, 1936, because of vomiting, high fever and "fast breathing." He had been seen frequently in the outpatient department with infections of the respiratory tract. Seven days before admission to the hosptial he had a temperature of 102 F. The right ear was draining profusely, and there were a few fine râles in the upper lobe of the right lung posteriorly. Although the child did poorly he was not brought back for further observation until the night of admission. At that time the temperature was 103.8 F. He presented a picture of extreme exhaustion, with marked restlessness. The most striking feature revealed by the examination was the child's rapid respiratory rate. The depth and the rapidity of respiration were so great that one member of the house staff remarked that the child was "panting like a dog." There was no cyanosis, and nothing abnormal could be made out from examination of the chest. The child had bilateral purulent otitis media. The pharynx was injected, and there was considerable postnasal discharge. The white blood cell count was 24,000. The urine reduced Benedict's solution and gave a strongly positive reaction to ferric chloride and a negative reaction for acetone.

Immediately after admission, because the patient appeared clinically to be acidotic, he was given 1.7 Gm. of sodium bicarbonate intravenously in 130 cc. of

a 5 per cent solution of dextrose. The next morning his temperature was 105.4 F., and the respiratory distress was unchanged. It was noted for the first time that there was marked diuresis and that the infant was exceedingly thirsty. At this time the $p_H$ of the blood was 7.29, the carbon dioxide content 29.2 volumes per cent, the alkali reserve 27.4 volumes per cent and the nonprotein nitrogen content 100 mg. per hundred cubic centimeters. Additional amounts of sodium bicarbonate and dextrose solution were given intravenously. Persistently positive ferric chloride tests of the urine and the very deep and fast respirations made us suspect salicylate poisoning, and the parents were questioned further. It was then learned that the child had been given acetylsalicylic acid frequently and that during the three days preceding admission he had received one 5 grain tablet (0.32 Gm.) of acetylsalicylic acid every three hours. Since the infant weighed only 4,700 Gm., this represented a total dose of over 1.5 Gm. per kilogram of body weight in three days. The administration of large amounts of fluid was continued by mouth and parenterally. The child's condition improved considerably, but the temperature remained elevated. Typical physical signs of pneumonia were found in the upper lobe of the right lung posteriorly. On the third day the $p_H$ of the blood was 7.30, the carbon dioxide content 53.1 volumes per cent and the alkali reserve 50 volumes per cent. The diuresis had abated, and the urine no longer contained salicylates. The respiratory rate did not return to normal until the temperature fell by crisis, on the sixth day. Recovery from this point was uneventful.

Case 3.—A white girl 12 years of age entered the Duke Hospital on May 16, 1932, because of active rheumatic infection. She had had vague rheumatic pains for the previous three years. On her first visit to the dispensary, on March 11, 1932, she was pale and malnourished and had evidence of mitral stenosis. The administration of 0.6 Gm. of sodium salicylate three times a day was advised. It is uncertain to what extent the drug was taken. Two months later the patient was admitted to the hospital with an acute exacerbation of her disease. Her temperature was 101 F., her pulse rate 150 and her respirations 26 per minute. She was given 0.6 Gm. of sodium salicylate three times a day, and the dose was soon increased to 0.9 Gm. every four hours. By the third day the patient had taken 12.6 Gm. of sodium salicylate. She refused all food and began to vomit. Her respirations increased to 40 per minute, and her temperature rose to 102 F. She was stuporous and unresponsive. The urine gave a positive test for acetone and contained large amounts of salicylates. The carbon dioxide-combining power of the blood was 21.4 volumes per cent. The patient was repeatedly given dextrose and lactate-Ringer solution[1] intravenously. Little improvement was noted until about twenty-four hours later, when she responded to stimuli and took fluids eagerly by mouth. At this time her temperature and respirations were normal, and the carbon dioxide-combining power of the blood was 42.8 volumes per cent. The remainder of her stay in the hospital was uneventful.

The histories of these three patients are in general accord with those in the cases of salicylate poisoning described in the literature. In all our patients the most striking symptom was marked hyperpnea. Although the respiration suggested that seen with acidosis, it was more rapid than the usual Kussmaul type. All three children had eaten and taken fluids poorly and were dehydrated. All showed a reduction in the carbon

1. Marriott, W. McK.: Infant Nutrition, St. Louis, C. V. Mosby Company, 1935, p. 265.

dioxide content of the blood. In only one instance was the $p_H$ of the blood determined at the time the carbon dioxide content was reduced. The child had uncompensated acidosis with a decreased $p_H$ of the blood. All the children had persistent elevation of the temperature. In cases 2 and 3 the fever was probably due at least in part to infection. The child in case 1 had no apparent cause for fever other than the drug he had ingested.

Hanzlik [2] reviewed the literature on salicylates up to 1926. Some of the more recent work has been discussed in a paper by Bowen, Ronfa and Clinger.[3] In contrast to the general agreement as to the clinical and pathologic manifestations of salicylate poisoning, the reports in regard to the nature of the physiologic disturbances underlying the intoxication are confusing and contradictory. Quincke [4] described the similarity of the dyspnea seen in a case of salicylate poisoning to that seen in diabetic coma. He concluded that the action of salicylates in stimulating respiration must be similar to the action of ketone bodies. When Quincke's paper was published the action of neither of these agents was clearly understood. Later it was established that the dyspnea of diabetic coma is due to ketone body acidosis. The theory of primary acidosis in salicylate poisoning received apparent support from the observation by several investigators that the alkali reserve of the blood is usually reduced and that the administration of sodium bicarbonate frequently gives symptomatic relief. Johnson [5] in 1930 reported that salicylates cause a reduction in the carbon dioxide combining power of the blood with no change in the $p_H$. He interpreted his findings as evidence of a fixed acid acidosis compensated by a loss of carbon dioxide. An increase in the lactic acid content of the blood was thought to be at least partly responsible for the acidosis. Using the dialysis method of Levy, Rowntree and Marriott,[6] Johnson reported such unusual figures for the $p_H$ of normal blood (from 7 to 7.2) that it is difficult to evaluate the significance of his results. Odin [7] investigated changes in

2. Hanzlik, P. J.: The Actions and Uses of Salicylates and Cinchophen in Medicine, Medicine **5**:197, 1926.

3. Bowen, B. D.; Ronfa, J. F., and Clinger, O. W.: The Differential Diagnosis of Salicylate Poisoning and Diabetic Acidosis: Report of a Case, J. A. M. A. **107**:276 (July 25) 1936.

4. Quincke, H.: Zur Kenntnis der Salicylsäurewirkung, Berl. klin. Wchnschr. **19**:709, 1882.

5. Johnson, C. C.: The Salicylates: XIX. The Question of Acidosis Following the Administration of Salicylates, J. A. M. A. **94**:785 (March 15) 1930.

6. Levy, R. L.; Rowntree, L. G., and Marriott, W. McK.: A Simple Method for Determining Variations in the Hydrogen-Ion Concentration in Blood, Arch. Int. Med. **16**:389 (Sept.) 1915.

7. Odin, M.: Is Salicyl Poisoning an "Acidosis"? Acta med. Scandinav. (supp.) **50**:177, 1932.

the acid-base balance of the blood and of the urine of subjects with hyperpnea due to salicylates and proved conclusively that the marked increase in the rate and the depth of respiration seen early in salicylate poisoning is not due to acidosis. The $p_H$ of the blood and of the urine at this time is more alkaline than normal, and the moderately reduced alkali reserve in the blood represents a compensatory loss of base bicarbonate. Odin found that later in the intoxication the urine contained more acid than normal, owing, he stated, to retention of alkali to make up for the earlier loss of base in the urine. He and others [8] expressed the belief that hyperpnea due to salicylates must be attributed to central stimulation of respiration by the drug. We shall return to the question of central stimulation later, in connection with our experimental results.

One of the well recognized clinical effects of therapeutic doses of salicylates is reduction of fever through an increase in the loss of heat brought about by dilation of the capillaries of the skin and by an increase in sweating. Barbour [9] showed that 1 Gm. of acetylsalicylic acid given by mouth lowered the temperature of febrile patients to slightly below normal and caused an increase of about 38 per cent in the dissipation of heat, with a slight decrease in the production of heat, that is, in gaseous metabolism. Barbour and Devenis [10] reported that in five normal persons, on the other hand, the same dose of acetylsalicylic acid had little effect on the elimination of heat but increased the production of heat by about 9 per cent. Denis and Means [11] made daily determinations of the metabolism of three adults who were given large doses of sodium salicylate (up to 6.6 Gm. per day) and found an increase of 15 per cent in the basal metabolism of one person while the other two failed to show an increase. Sylla [12] reported an increase in the metabolic rate of a woman with salicylate poisoning. He attributed the increase in metabolism largely to the muscular exertion of deep and rapid respiration.

With the hope of throwing more light on the physiologic effect of salicylates, we studied the effects of the drug on animals. Large doses of salicyl compounds were given to five normal unanesthetized dogs.

8. Gebert, K.: Die Atmung nach therapeutischen Salicylgaben, Ztschr. f. klin. Med. **117**:147, 1931.

9. Barbour, H. G.: Acetylsalicylic Acid and Heat Regulation in Febrile Cases, J. Pharmacol. & Exper. Therap. **13**:500, 1919.

10. Barbour, H. G., and Devenis, N. W.: Acetylsalicylic Acid and Heat Regulation in Normal Individuals, J. Pharmacol. & Exper. Therap. **13**:499, 1919.

11. Denis, W., and Means, J. H.: The Influence of Salicylates on Metabolism in Man, J. Pharmacol. & Exper. Therap. **8**:273, 1916.

12. Sylla, A.: Ueber das grosse Atemminutevolumen, mit besonderer Berücksichtigung eines Falles von Aspirinvergiftung, Med. Klin. **31**:314, 1935.

Dog 1 received 0.2 Gm. of acetylsalicylic acid per kilogram of body weight by mouth within two hours.

Dog 2 received 0.3 Gm. of acetylsalicylic acid per kilogram by mouth daily for three days.

Dog. 3 received 0.4 Gm. of sodium salicylate per kilogram intravenously in divided doses within five hours.

Dog 4 received 1.5 Gm. of sodium salicylate per kilogram intravenously in ten doses in three days.

Dog 5 received 0.8 Gm. of methyl salicylate per kilogram subcutaneously in a single dose.

The dogs were all allowed water ad libitum and were fed once daily as usual. The general behavior of the animals was closely observed, and the temperature, the pulse rate and the respiratory rate were recorded at frequent intervals. Specimens of urine obtained by catheterization were studied qualitatively, and studies of the acid-base balance and determinations of the nonprotein nitrogen were carried out on the blood.

Although different doses of three salicyl compounds were used, the results in all five experiments were similar. None of the animals was made very sick by the drug administered. All except one, which was killed for pathologic study, recovered completely. All continued to eat eagerly throughout the experiment, and all drank unusually large amounts of water. There was no significant change in body temperature or pulse rate. A reduction in voluntary activity was noted in most instances. All subjects showed a marked tendency to pant whenever active or excited, and even when the subject was at rest the respiratory rate was faster than normal. There was considerable diuresis in most of the animals. The urine contained salicylates within an hour after the drug was first given, and excretion of the drug persisted for three or four days after the last dose. Dogs 1 and 2 secreted acid urine throughout the period of observation. Dogs 3 and 4 had alkaline urine. No acetone or diacetic acid was detected in the urine at any time. All subjects had considerable albuminuria, with red and white cells and casts in the urine. Although the qualitative findings were the same, the abnormal urinary findings were more marked for our dogs than is usual with subjects in the clinic. There was surprisingly little evidence of failure of function of the kidneys considering the severity of the changes in the urine. In only one instance was there even moderate retention of nitrogen. The nonprotein nitrogen of the blood of dog 2 reached 50 mg. on the last day that salicylates were given but returned to normal two days later. All the urinary findings became normal at about the time that salicylates ceased to appear in the urine. There was no marked change in the acid-base chemistry of the blood of the dogs. Samples drawn when the animals were panting vigorously tended to have a slightly elevated $p_H$. No acidosis was observed at any stage of the experiments. The pathologic changes observed in the one animal which was killed were similar to those which have been described by other writers. There were edema, congestion and petechial hemorrhage in the gastro-intestinal mucosa and in various other tissues. The kidneys showed slight degenerative changes in the tubules.

In reviewing this first group of experiments, one is impressed by the fact that normal dogs can tolerate without serious consequences amounts of salicylate comparable to doses which caused severe intoxication in children. Such signs of intoxication as were noted in the animals, namely, the increase in the respiratory rate and the abnormal urinary findings, were similar to those seen in poisoning in human

beings. The difference was that in the dogs these changes were not accompanied by the more alarming symptoms we had seen in children.

We next turned our attention to a more intensive study of the hyperpnea of salicylate intoxication. Haldane [13] and Adolph [14] have emphasized the association between the respiratory rate and the sensation of heat in man. The relationship is more marked with dogs because their chief method of dissipating heat is by panting. Since salicyl compounds have been shown to increase the production of heat and at the same time to hasten the dissipation of heat through dilation of the capillaries of the skin, it seemed possible that the hyperpnea seen in the absence of acidosis might be associated with changes in the regulation of heat. There was also the possibility that the increase in the respiratory rate was due to direct stimulation of the respiratory center by salicylates.

For the study of changes in the respiratory rate and the gaseous exchange following the administration of salicylates, experiments were carried out on dogs anesthetized with sodium barbital. A tracheal cannula was inserted and was connected to a Benedict-Roth metabolism machine so that we could record the oxygen consumption and the respiratory rate and depth before and after the intravenous injection of sodium salicylate. The rectal temperature was observed at frequent intervals. The blood pressure and the pulse rate were recorded. The blood pressure showed no significant variation. The pulse rate was frequently, but not always, considerably increased.

The immediate response in every instance to the intravenous injection of 0.1 Gm. of sodium salicylate per kilogram of body weight was an abrupt rise in oxygen consumption. There was a prompt but moderate increase in the depth of respiration coincident with an increase in the metabolic rate. In no subject, however, was there any significant change in the respiratory rate immediately after the injection of the drug. The rectal temperature began to rise within about an hour after the injection of salicylate and rose progressively to dangerously high levels (from 108 to 112 F.). With the elevation in temperature the respiratory rate finally began to increase and became progressively faster until rates of 200 or more per minute were reached. Death occurred several hours after the administration of the drug and was apparently due to hyperpyrexia and exhaustion.

The severe disturbance caused in these subjects by doses of salicylate smaller than those which had been tolerated without difficulty by normal unanesthetized dogs was at first most surprising. That the same increase in metabolic rate occurs in conscious animals was shown by determination of the rate of oxygen consumption of one trained unanesthetized dog before and after the injection of sodium salicylate. In this experiment a Blalock mask [15] was placed over the face of the dog only while the metabolic rate was being recorded. At all other times the dog was free to breathe normally. The rate of oxygen consumption rose sharply after the injection of the salicylate. In spite of the rise in the

13. Haldane, J. S.: The Influence of High Air Temperatures, J. Hyg. **5**:494, 1905.

14. Adolph, E. F.: The Effect of Exposure to High Temperatures upon the Circulation in Man, Am. J. Physiol. **67**:573, 1924.

15. Blalock, A.: A Rubber Mask for the Determination of Oxygen Consumption of the Dog, J. Lab. & Clin. Med. **12**:378, 1927.

metabolic rate the rectal temperature did not change significantly throughout the experiment. The reason for the high fever and the excessively rapid rate of respiration of our anesthetized subjects on which a tracheal cannula was used must lie in the artificiality of the experiment. On further thought we realized that by anesthetizing the dogs and forcing them to breathe through a tracheal cannula we had made it impossible for them to increase the evaporation of water from their mouths by panting. Salicylates had increased the heat production and so had produced fever in animals which had lost the ability to dissipate heat effectively. As the temperature rose, the respiratory rate increased, but because of the experimental conditions respiration was rendered ineffective as a means of increasing the loss of heat. The temperature rose progressively, and there was an ever increasing stimulus to more rapid respiration. As a result, both the body temperature and the respiratory rate became excessively high. The fever, as well as the muscular exertion of the excessive respiration, further increased the metabolic rate. Once this cycle of events was initiated, the condition progressed rapidly to a fatal ending.

We next artificially aided the loss of heat by anesthetized subjects on which a cannula had been used by shaving the ventral portion of the body and placing the dog in front of an electric fan. The rectal temperature was closely observed, and whenever there was a rise of 0.1 degree F. the dissipation of heat was further increased by wetting the skin with alcohol. By this means we could prevent any significant rise in temperature after the injection not only of 0.1 Gm. of sodium salicylate per kilogram but also of four or five doses of this size repeated at fifteen minute intervals. By a rapid repetition of doses, metabolic rates of from 300 to 400 per cent of normal could be obtained without a change in the body temperature or a marked change in the respiratory rate. Other experiments were done in which the excessive response in temperature and in metabolic and respiratory rates was allowed to develop, after which the dissipation of heat was suddenly increased by sponging with alcohol and by the use of the fan. The response of the respiratory rate varied somewhat in different experiments. When the cooling was started almost immediately after the temperature had risen 2 or 3 F. and the respirations had become rapid, the respiratory rate promptly returned to about the normal level as soon as the temperature began to fall. In experiments in which cooling was delayed until after the temperature rose to from 106 to 108 F., and an excessively fast respiratory rate and a high metabolic rate had persisted for some time, it was more difficult to bring the respiratory rate back to normal. A rate of from 50 to 60 per minute usually persisted even though the body temperature had been lowered to normal. We interpreted the lag as being analogous to the increase in the respiratory rate seen for some time after hard exercise, when the metabolism has been temporarily raised to a high level and so-called oxygen debt has been incurred. Possibly, also, the anesthetic may have played some rôle.

We also studied the acid-base equilibrium at various stages of intoxication in our anesthetized animals on which a cannula had been used. Samples of blood taken soon after extreme hyperpnea had developed showed considerable increase in the $p_H$ due to loss of carbon dioxide by hyperventilation. There was a compensatory decrease in alkali reserve in the blood, and the animals secreted alkaline urine. Somewhat later, when repeated administration of salicylates, fever and the exertion of extremely rapid respiration had all combined to hold the metabolic rate at a high level for some time, moderate acidosis was observed. As an agonal change in the last minutes of life, there was usually marked slowing of the excessive respiratory rate and rapid accumulation of carbon dioxide, with lowering of the $p_H$ of the blood to 7.00 or even lower just before death.

A summary of the data obtained on four of our twelve anesthetized subjects is presented in tabular form. The data on dogs 4 and 6 show the marked elevation in temperature and the extreme hyperpnea which resulted from the intravenous

*Effect of Intravenous Administration of Sodium Salicylates on Anesthetized* Dogs with Tracheal Cannulas*

| Method of Administration | Dog | Time | Respiratory Rate per Minute | Oxygen Consumed per Minute, Cc. | Body Temperature, F. | Pulse Rate per Minute | Comment |
|---|---|---|---|---|---|---|---|
| Dogs received a single dose of 0.1 Gm. of sodium salicylate per kilogram intravenously | 4 | 2:35 p.m. | 21 | 123 | 100.5 | 160 | |
| | | 2:47 p.m. | .. | ... | ..... | ... | Received 0.1 Gm. of sodium salicylate per kilogram intravenously |
| | | 2:55 p.m. | 25 | 183 | 100.8 | 156 | Oxygen consumption measured for ten minute period; other observations in middle of period |
| | | 3:30 p.m. | 32 | 195 | 101.6 | 134 | |
| | | 4:00 p.m. | 37 | 214 | 102.8 | 126 | |
| | | 5:30 p.m. | 44 | 210 | 105.3 | 100 | |
| | | 5:45 p.m. | 117 | 245 | 106.0 | 96 | $p_H$ of serum, 7.61; $CO_2$ content, 30.5 volumes %; alkali reserve, 29.6 volumes %; urine, alkaline |
| | | 7:00 p.m. | 180 | ... | 108.0 | .. | Respirations so fast and labored that it was impossible to get satisfactory determination of oxygen used |
| | | 8:00 p.m. | 200 | ... | 110.0+ | .. | Dog died soon after this observation |
| | 6 | 11:15 a.m. | 19 | 147 | 101.6 | 144 | |
| | | 11:20 a.m. | .. | ... | ..... | ... | Received 0.1 Gm. of sodium salicylate per kilogram intravenously |
| | | 12:10 p.m. | 27 | 237 | 103.6 | 156 | |
| | | 12:45 p.m. | 63 | 269 | 106.6 | 156 | |
| | | 1:45 p.m. | 120 | 309 | 106.8 | 160 | Experiment discontinued |
| Dog received repeated doses of sodium salicylate; it was artificially cooled from time of first dose | 12 | 10:35 a.m. | 52 | 68 | 102.0 | 126 | Dog small and healthy; no explanation for rapid respiration; had been same for one hour; at 10:40 received 0.1 Gm. of sodium salicylate per kilogram intravenously |
| | | 10:53 a.m. | 57-60 | 106 | 101.0 | 178 | At 11:05 received 0.1 Gm. of sodium salicylate per kilogram intravenously |
| | | 11:18 a.m. | 57-60 | 153 | 101.4 | 170 | At 11:25 received 0.1 Gm. of sodium salicylate per kilogram intravenously |
| | | 11:40 a.m. | 51 | 198 | 101.8 | 200† | At 11:47 received 0.1 Gm. of sodium salicylate per kilogram intravenously |
| | | 12:00 noon | 52-57 | 230 | 102.4 | 200 | Dog apparently in good condition as long as he was kept cool |
| Dog received two doses of sodium salicylate; it was artificially cooled only after fever had developed | 8 | 9:50 a.m. | 8 | 80 | 98.6 | 160 | At 10:08 received 0.2 Gm. of sodium salicylate per kilogram intravenously |
| | | 10:15 a.m. | 10 | 145 | 98.8 | 152 | |
| | | 10:35 a.m. | 10 | 116 | 99.0 | ... | |
| | | 11:35 a.m. | 12 | 118 | 99.5 | 162 | |
| | | 12:50 p.m. | 14 | 119 | 99.9 | ... | At 1:06 p.m. received 0.2 Gm. of sodium salicylate per kilogram intravenously |
| | | 1:12 p.m. | 18 | 160 | 100.5 | 176 | |
| | | 1:25 p.m. | 20 | 159 | 101.0 | ... | |
| | | 2:25 p.m. | 29 | 173 | 103.0 | 180 | |
| | | 3:15 p.m. | 75 | 186 | 105.0 | 180 | Cooling started at 3:35 p.m. |
| | | 3:45 p.m. | 75-44 | 179 | 104.1 | 160 | Respiratory rate fell rapidly |
| | | 4:00 p.m. | 41-31 | 151 | 101.5 | 140 | |
| | | 4:15 p.m. | 28 | 133 | 98.6 | 120 | |

* All animals received 0.3 Gm. of sodium barbital per kilogram one hour before observations were started.

injection of 0.1 Gm. of sodium salicylate per kilogram in anesthetized dogs forced to breathe through a tracheal cannula. Dog 12 received four doses of 0.1 Gm. of sodium salicylate per kilogram within two hours but was artificially cooled to prevent a rise in temperature. Although the metabolism as measured by the oxygen consumed per minute was increased nearly fourfold, there was no significant change in the respiratory rate, and the dog remained in good condition as long as the artificial cooling was continued. When the cooling was stopped, high fever and severe hyperpnea rapidly developed. In the fourth experiment (dog 8), fever and hyperpnea were allowed to develop before artificial cooling was started. With cooling there was a prompt decrease in the respiratory rate, although the rate still remained faster than it had been before the drug was given.

Barbour [9] and Barbour and Devenis [10] stated that salicylates increase the metabolism in afebrile subjects but lower it in febrile patients. We hesitated, therefore, to assume that increased heat production was present in cases of poisoning in patients with fever. One of us served as an experimental subject for studies on metabolism designed to test this point. The basal metabolic rate was determined, and a test of the metabolism was repeated at intervals after the oral administration of 90 grains (5.76 Gm.) of sodium salicylate. A rise of 23 per cent in the metabolism, together with a 100 per cent increase in the respiratory rate (from 10 to 20) was induced by this dose. Several days later, after a preliminary determination of the basal rate, the same subject was made febrile by the intravenous injection of typhoid vaccine. The rate of metabolism rose somewhat with the fever, as would be expected. When the temperature had reached 101 F., 90 grains (5.76 Gm.) of sodium salicylate was again administered. There were profuse sweating and more rapid respiration, and the temperature fell to 100 F. At a given level of temperature, however, the metabolic rate was from 20 to 25 per cent higher after the dose than before its ingestion. We had, therefore, no indication of any anomalous behavior of salicylates in a febrile subject. With this large dose the increase in metabolism was greater than the decrease in metabolism due to the lowering of temperature, and the net result was an increase in metabolism during fever as well as when the subject was afebrile.

Changes in temperature, the sensation of heat and the increase in gaseous exchange induced by salicylates appear to us to be of much greater importance in producing an increase in the respiratory rate and depth than any direct central action of the drug. The concentration of salicylate which reached the respiratory centers of our artificially cooled dogs (data on dog 12, in table) to which repeated injections of salicylate were given must have been higher than that present in uncooled subjects which received only a single dose. Nevertheless, the artificially cooled animals showed no significant change in respiratory rate, while the uncooled subjects had extreme dyspnea when the body temperature rose.

The direct effects of salicylates are an increase in the metabolic rate, an increase in the dissipation of heat, nausea and vomiting, irritation of the kidneys and more or less mental disturbance, all not in themselves immediately dangerous. The disparity between the dose of salicylate ingested and the severity of the intoxication produced is in accord with the idea that the more alarming symptoms are secondary complications

which arise when the organism is unable to compensate for the action of the drug. The poisoned subject loses fluid rapidly through vomiting, diuresis and sweating. Because of mental confusion he cooperates poorly in taking fluids even when they are available. With a low fluid intake, the fluid reserves of the body are soon depleted. Dehydration, in turn, soon places the patient at a tremendous disadvantage. Adequate secretion of sweat becomes impossible, and the loss of heat through evaporation is thereby decreased at a time when the heat production is higher than normal. A rise in body temperature results. Urinary secretion diminishes, and there are retention and prolongation of the action of the drug as well as accumulation of metabolic waste products in the body. As the blood becomes concentrated and more viscous, the circulation becomes inadequate to keep up with the demands for oxygen and the removal of carbon dioxide, and acidosis develops. As the food reserves of the body are taxed to maintain the rapid metabolic rate, the production and the accumulation of ketone bodies frequently add to the acidosis. The increase in gaseous metabolism, the sensation of heat and the acidosis all contribute to the production of extreme hyperpnea. Fever and exertion due to restlessness and the increase in the respiratory rate further increase the metabolic rate and add to the vicious course of events. In short, the various direct actions of large doses of salicylates are such as to make an untreated person and especially an untreated infant, who cannot even ask for water, tend to reach a condition in which he is handicapped in making adjustments to the action of the drug, in much the same way as that in which our anesthetized experimental subjects were hindered. Because dehydration causes a more gradual interference with the ability to dissipate heat than does the introduction of a tracheal cannula in a dog, a fatal degree of intoxication develops more slowly, and extreme hyperpyrexia is a less prominent feature than it was in the subjects of our artificial experiments. The longer duration of the increase in metabolism in the presence of dehydration in man makes acidosis a more prominent feature of the maladjustment to the action of salicylates.

From our studies it is evident that rational treatment of salicylate poisoning should be aimed at the prevention of complications. It should include measures to hasten the elimination of the drug and of metabolic waste products, to aid in the dissipation of heat and to furnish fuel for the increased metabolism. The administration of large amounts of fluid is of first importance in accomplishing these aims. That the amount of fluid which is adequate is really enormous is shown by the extreme thirst manifested by our patients, by our experimental animals and by one of us who took large doses of salicylates. When vomiting and mental confusion make the patient unable to take adequate fluids by mouth they should be given parenterally. If

fever is present, it may be desirable to supplement the administration of fluids with measures to increase the loss of heat, such as sponging with alcohol. If one judges from our animal experiments, cooling measures may be expected to furnish considerable relief from the distressing hyperpnea. Food if it can be retained or when necessary dextrose administered parenterally should be furnished as rapidly as is feasible in order that excessive catabolism of body tissue may be avoided and ketone body acidosis guarded against. When such therapy can be provided early in the intoxication the chances are good that no alarming secondary symptoms will develop after the ingestion of extremely large doses of salicylate. Late in the course of the condition in cases in which the patient has been untreated and in which acidosis has developed, it may be necessary to supplement this treatment with the administration of alkali. When the acidosis can be overcome, urinary flow reestablished and adequate fluids restored, the chance of recovery without permanent injury is good even for persons in the late severe stages of salicylate intoxication.

## SUMMARY

The administration of salicylates causes a prompt increase in both the production and the elimination of heat. No serious symptoms are produced by the administration of large amounts of salicylate to experimental subjects as long as the intake of fluid is adequate and there is no interference with the processes of the elimination of heat. When the ability to dissipate heat is experimentally interfered with, otherwise harmless doses of the drug cause death as a result of hyperpyrexia and exhaustion. In patients, when dehydration causes a similar inability to adapt themselves to the action of the drug, alarming symptoms of salicylate poisoning develop. Treatment of salicylate intoxication should place first emphasis on the administration of large amounts of fluid, together with other measures to aid in the dissipation of heat. Later in the intoxication, when acidosis is often present, alkali should also be given.

# STREPTOCOCCIC MENINGITIS AND ABSCESS OF THE BRAIN COMPLICATING SCARLET FEVER

## REPORT OF THREE CASES IN WHICH THE PATIENTS RECOVERED

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Purulent involvement of the central nervous system is an infrequent complication in cases of scarlet fever. Including the ones reported by us, there were only 74 reported cases of suppurative meningitis in 59,254 cases of scarlet fever, an incidence of less than 1 per cent (table 1). The occurrence of abscess of the brain is much rarer than this.[1]

TABLE 1.—*Number of Cases of Streptococcic Meningitis with Scarlet Fever as Reported by Various Observers*

| Authors | Year | Number of Cases | |
|---|---|---|---|
| | | Scarlet Fever | Streptococcic Meningitis |
| Bernard* | 1909 | 13,500 | 28 |
| Weaver [2a] | 1924 | 2,600 | 2 |
| Zischinsky [2g] | 1928 | 20,000 | 10 |
| J. E. Gordon and Top [2h] | 1935 | 17,311 | 19 |
| M. B. Gordon, Litvak and Caronna | 1931-36 | 5,843 | 15 |
| Total | | 59,254 | 74 |

* Bernard, F.: Rev. de méd. **29**: 365, 1909.

At the Kingston Avenue Hospital 15 instances of suppurative meningitis and 2 of abscesses of the brain occurred in 5,843 cases of scarlet fever from 1931 to 1935, inclusive. Two of the children with streptococcic meningitis and 1 with abscess of the brain recovered. We have

From the Kingston Avenue Hospital, department of hospitals, New York City, services of Dr. Murray B. Gordon and Dr. Harold L. Barnes.

1. (*a*) Weaver, G., in Abt, I. A.: Pediatrics, Philadelphia, W. B. Saunders Company, 1924, vol. 6, p. 335. (*b*) Goodall, E. W., and Washbourn, J. W.: Text-Book of Infectious Diseases, London, H. K. Lewis & Co., Ltd., 1928. (*c*) Ker, C. B.: Infectious Diseases, London, Oxford University Press, 1920. (*d*) Rolleston, J. D.: Acute Infectious Diseases, New York, Physicians and Surgeons Book Company, 1925.

been able to collect from the literature 8 other cases of recovery from meningitis with this disease [2] (table 2).

Studies of the incidence of streptococcic meningitis without reference to any accompanying disease have been made by Rosenberg and Nuttley,[3] Felsen and Osofsky [4] and Gray.[5] The latter collected 66 instances of recovery reported over a period of thirty-four years, including his own, but he failed to include the cases of Delger,[2a] Zischinsky [2f] and Strat-

TABLE 2.—*Summary of Cases of Streptococcic Meningitis Complicating Scarlet Fever in Which the Patient Recovered*

| No. | Age, Years | Sex | Author and Year | Bacteria in Spinal Fluid | Possible Source of Infection | Therapy Employed |
|---|---|---|---|---|---|---|
| 1 | 7 | F | Voss,[2e] 1905 | Streptococcus, type not determined | Scarlet fever, otitis media, mastoiditis, meningitis | Mastoidectomy and spinal drainage |
| 2 | 5 | F | Ohnacker,[2d] 1911 | Streptococcus, type not determined | Severe scarlet fever, otitis media, mastoiditis, meningitis | Mastoidectomy and antistreptococcic serum intraspinally |
| 3 | 7 | M | Delger,[2a] 1927 | Str. haemolyticus | Scarlet fever, otitis media, mastoiditis, meningitis | Mastoidectomy |
| 4 | 7 | F | Neal and Jones,[2c] 1927 | Str. haemolyticus, scarlatinal group | Scarlet fever, otitis media, meningitis | Antiscarlatinal serum intraspinally |
| 5 | 8 | M | Zischinsky,[2g] 1930 | Str. haemolyticus | Moderate scarlet fever, otitis media, meningitis | Spinal drainage |
| 6 | 11 | M | Neal,[2b] 1930 | Str. haemolyticus, scarlatinal group | Scarlet fever, otitis media, meningitis | Antiscarlatinal serum intraspinally and intracisternally |
| 7 | 5 | M | Gordon and Top,[2h] 1935 | Streptococcus, type not mentioned | Scarlet fever, otitis media, mastoiditis, meningitis | Mastoidectomy, antiscarlatinal serum intravenously, lumbar puncture |
| 8 | 12 | M | Zischinsky, 1935 | Str. haemolyticus | Scarlet fever, primary | Spinal drainage and autogenous vaccine |
| 9 | 4 | M | Gordon, Litvak and Caronna, 1936 | Streptococcus, type not determined | Scarlet fever meningitis, primary | Antiscarlatinal serum intraspinally and intravenously |
| 10 | 11 | M | Gordon, Litvak and Caronna, 1936 | Str. haemolyticus, scarlatinal group | Scarlet fever, otitis media meningitis | Antiscarlatinal serum intraspinally and intracisternally |

2. (*a*) Delger, B.: Arch. latino-am. de pediat. **21**:98, 1927. (*b*) Neal, J. B.: Personal communications to the authors, 1930. (*c*) Neal, J. B., and Jones, A.: Arch. Pediat. **44**:395, 1927. (*d*) Ohnacker, P.: Ztschr. f. Ohrenh. **63**:333, 1911. (*e*) Voss: Charité-Ann. **29**:700, 1905. (*f*) Zischinsky, H.: Jahrb. f. Kinderh. **127**:370, 1930; (*g*) München. med. Wchnschr. **82**:2028, 1935. (*h*) Gordon, J. E., and Top, F. H.: J. Pediat. **6**:770, 1935.

3. Rosenberg, L., and Nuttley, H. W.: Ann. Int. Med. **4**:1154, 1931.

4. Felsen, J., and Osofsky, A. G.: Streptococcus (Viridans) Meningitis with Recovery: Immunologic Studies, J. A. M. A. **102**:2170 (June 30) 1934.

5. Gray, H. J.: Streptococcic Meningitis: Report of Case with Recovery, J. A. M. A. **105**:92 (July 13) 1935.

ton.[6] Since then, cases in which the patient recovered have been reported by Gordon and Top,[2h] Greenfield,[7] Cracovaner,[8] Zischinsky [2f] and Zeligs,[9] the last having cited 2 instances. Including the reports of our 2 cases, there are now records of 77 recoveries from streptococcic meningitis in the literature.

## REPORTS OF CASES OF SCARLET FEVER WITH STREPTOCOCCIC MENINGITIS

CASE 1.—J. R., a boy 4 years of age, was admitted to the Kingston Avenue Hospital to the service of Dr. H. L. Barnes on the sixth day of his illness with scarlet fever. He was exceedingly toxic, with marked congestion of the throat, a purulosanguineous nasal discharge, pronounced cervical adenitis, a fading scarlatinal eruption and a temperature of 104 F., a pulse rate of 130 and a respiratory rate of 32. He was given 10,000 units of antiscarlatinal serum intramuscularly.

Signs of meningitis appeared on the fourth day of his stay in the hospital, the tenth day after the onset of the scarlet fever. On lumbar puncture, purulent cerebrospinal fluid under increased pressure was obtained, which on examination revealed 13,000 cells, all polymorphonuclears, a 4 plus reaction for albumin and for globulin and a 2 plus Fehling reaction. A gram-positive diplococcus with a tendency to chain formation, interpreted as a streptococcus, was obtained on smear and culture. The type and group were not mentioned.

For the following seven days the boy received daily a lumbar puncture, an intraspinal injection of 10,000 units of antiscarlatinal serum and an intravenous injection of 10,000 units. In all, he received 70,000 units intraspinally, 65,000 units intravenously and 10,000 units intramuscularly without any serum reaction.

There was no history of infection of the middle ear, mastoid or sinuses, nor were there any manifestations of such infection during the entire illness. Smears and cultures of the spinal fluid continued to show gram-positive diplococci throughout the clinical course until recovery, but blood cultures were always sterile. Hemolytic streptococci were obtained on culture of material from the throat. The Wassermann reactions of the blood and spinal fluid and cultures for the Klebs-Löffler bacillus were negative.

The patient was discharged on the forty-second day of his illness without any residual signs. The data on the cerebrospinal fluid are given in detail in table 3.

CASE 2.—In W. P., a boy of 11 years, otitis media of the right ear developed on the fourteenth day of his illness with scarlet fever, and the abscess ruptured spontaneously a few days later. On the twenty-seventh day of his illness there were a rise in temperature to 103 F., headache, vomiting and nuchal pain. On admission to the hospital the child presented signs of acute meningitis in addition to a pinpoint perforation in the right ear drum and bulging of the left drum. Bilateral paracentesis and lumbar puncture were performed. The spinal fluid was greenish and under moderate pressure and on examination gave a 3 plus reaction for albumin, a 3 plus reaction for globulin and a negative Fehling reaction. There were 1,200 cells, all polymorphonuclears. Smears and cultures revealed Strepto-

6. Stratton, J. C.: J. Am. Inst. Homeop. **17**:70, 1934.

7. Greenfield, S. D.: Laryngoscope **45**:325, 1935.

8. Cracovaner, A. J.: Laryngoscope **45**:541, 1935.

9. Zeligs, M.: Streptococcic Meningitis: Report of Two Cases with Recovery, Am. J. Dis. Child. **50**:1497 (Dec.) 1935.

coccus haemolyticus of the scarlatinal group. The boy was given 5,000 units of antiscarlatinal serum intraspinally and 5,000 units intramuscularly.

For the following three days the patient received daily injections of 5,000 units of antiscarlatinal serum, one intraspinally and one intramuscularly, but since his condition remained the same, 10,000 units was administered intraspinally and 5,000 units intravenously. In spite of this intensive treatment the temperature remained elevated, the meningeal syndrome, although less marked, was still present and streptococci were still found in the spinal fluid. At the suggestion of Dr. Josephine

TABLE 3 (case 1).—*Data on the Cerebrospinal Fluid in a Case of Streptococcic Meningitis Complicating Scarlet Fever, Showing the Results of Therapy with Antiscarlatinal Serum*

| Age of patient, 4 years | | | | | | | Units of Serum | |
|---|---|---|---|---|---|---|---|---|
| Date | Amount, Cc. | Appearance | Cells | Albumin | Fehling's Reaction | Bacteria | Intraspinally | Intravenously |
| 1/15 | 25 | Turbid | 13,000 Polymorphonuclears | 3+ | 2+ | Gram-positive | 10,000 | 10,000 |
| 1/16 | 20 | Turbid | 12,500 Polymorphonuclears | 3+ | 1+ | Diplococci | 10,000 | 10,000 |
| 1/17 | 25 | Turbid | 5,600 Polymorphonuclears | 3+ | — | | 10,000 | 10,000 |
| 1/18 | 25 | Turbid | 3,400 Polymorphonuclears | 3+ | ± | Tendency to long chain formation | 10,000 | 10,000 |
| 1/19 | 25 | Turbid | 2,800 Polymorphonuclears | 3+ | ± | | 10,000 | 10,000 |
| 1/21 | 18 | Turbid | 1,800 Polymorphonuclears | 2+ | 1+ | ..... | 10,000 | 10,000 |
| 1/23 | 18 | Turbid | 1,000 80% polymorphonuclears | 2+ | 1+ | | | |
| 1/25 | 20 | Cloudy | 400 60% polymorphonuclears | 2+ | 2+ | | | |
| 1/27 | 20 | Ground glass | 250 50% polymorphonuclears | 2+ | 2+ | | | |
| 2/ 4 | 20 | Clear | 80 lymphocytes | 1+ | 2+ | | | |

Neal, a cisternal puncture was performed and 10,000 units of antiscarlatinal antitoxin was administered. This was followed by progressive improvement in the child's condition, and he was discharged as completely recovered on the seventy-fifth day of his illness.

The data on the cerebrospinal fluid are given in detail in table 4.

## REPORTS OF CASES OF SCARLET FEVER WITH ABSCESS OF THE BRAIN

CASE 3.—A. N., a boy 7 years of age, contracted scarlet fever, which on the fourth day became complicated by otitis media of the right ear. On April 10,

seventeen days after the onset of his illness, he complained of headache; there were vomiting and a rise of the temperature to 103 F. Examination on admission to the Kingston Avenue Hospital revealed a purulent discharge from the right ear, marked meningeal syndrome with no involvement of the cranial nerves, normal fundi of the eyes and clinically normal mastoids. Lumbar puncture showed turbid

TABLE 4 (case 2).—*Data on the Cerebrospinal Fluid in a Case of Streptococcic Meningitis Complicating Scarlet Fever in Which Serum Therapy Was Used and the Patient Recovered*

Age of patient, 11 years

| Date | Amount, Cc. | Appearance | Cells | Albumin | Fehling's Reaction | Bacteria | Units of Serum: Intraspinally | Units of Serum: Intramuscularly | Units of Serum: Intravenously |
|---|---|---|---|---|---|---|---|---|---|
| 5/1 | 10 | Greenish | 1,200 Polymorphonuclears | 3+ | — | Str. haemolyticus, scarlatinal group | 5,000 | 5,000 | |
| 5/2 | 20 | Greenish | 2,000 Polymorphonuclears | 3+ | — | | 5,000 | 5,000 | |
| 5/3 | 20 | Greenish | 1,700 Polymorphonuclears | 3+ | — | | 5,000 | 5,000 | |
| 5/5 | 18 | Yellow | 1,200 Polymorphonuclears | 3+ | — | | 10,000 | 5,000 | |
| 5/7 | 15 | Yellow | 1,400 Polymorphonuclears | 3+ | — | | 10,000 | | |
| 5/10 | 15 | Cloudy | 1,200 Polymorphonuclears | 3+ | 1+ | 1+ | 10,000 | | |
| 5/13 | 12 | Cloudy | 900 Polymorphonuclears | 3+ | — | 1+ | | | |
| 5/17 | 30 | Cloudy | 11,000 Polymorphonuclears | 3+ | — | 1+ | ..... | ..... | 10,000 |
| 5/19 | 20 | Cloudy | 400 Polymorphonuclears | 2+ | 1+ | — | 10,000 | | |
| 5/21 | 18 | Ground glass | 150 Polymorphonuclears | 2+ | 1+ | | | | |
| 5/24 | 20 | Clear | 40-60% lymphocytes | 1+ | 1+ | | | | |
| 5/26 | 18 | Clear | Lymphocytes | 1+ | 2+ | | | | |
| 5/30 | 18 | Clear | 20 lymphocytes | 1+ | 2+ | | | | |

fluid under increased pressure, with 1,200 polymorphonuclears, an albumin and a globulin reaction of 3 plus and a Fehling reaction of 2 plus, and bacteriologic examination by smear and culture gave negative results. For the following five days the patient received daily 10,000 units of antiscarlatinal serum intraspinally and 5,000 units intravenously. Some improvement in the general condition followed, but not in the cerebrospinal fluid. On the tenth day in the hospital there were a rise in temperature to 104 F., bilateral nystagmus, facial weakness on the right side, yawning, delayed response to questions, loss of lower abdominal and cremasteric

reflexes and hypotonia of the right upper and lower extremities. On the basis of these findings and the absence of any organism in the cerebrospinal fluid, a diagnosis of abscess of the brain with sympathetic meningitis was made, and surgical intervention was considered. By the next day there had developed clonus of the right ankle, blurring of both disks and semistupor. Dr. E. J. Browder operated on April 25 on a temporal abscess of the right lobe. There was marked improvement in the child's condition for several days, but on the eighth postoperative day the symptoms recurred. Although clinically there was no involvement of the mastoid, the roentgen rays showed some cloudiness of the mastoid cells. A right mastoidectomy was performed, and a few necrosed cells were found. On May 16 symptoms of intracranial pressure reappeared, and the child was transferred to the Long Island College Hospital to Dr. E. J. Browder's service. The patient finally succumbed to suppurative cerebritis, in spite of a second operation and three blood transfusions.

The data on the spinal fluid are given in table 5.

CASE 4.—V. D., a girl 10 years of age, was admitted to the hospital on April 9, on the second day of illness with mild scarlet fever. The temperature subsided

TABLE 5 (case 3).—*Data on the Cerebrospinal Fluid in a Case of Sympathetic Meningitis Due to an Abscess of the Brain Complicating Scarlet Fever in Which the Outcome Was Fatal*

| Date | Amount, Cc. | Appearance | Cells* | Albumin | Globulin | Sugar Content, Mg. | Bacteria | Units of Serum | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Intraspinally | Intravenously |
| 4/11 | 20 | Turbid | 1,800 | 2+ | 1+ | 60 | 0 | 10,000 | 10,000 |
| 4/12 | 22 | Turbid | 1,600 | 2+ | 1+ | 62 | 0 | 10,000 | 10,000 |
| 4/13 | 25 | Turbid | 2,000 | 1+ | 1+ | 58 | 0 | 10,000 | |
| 4/14 | 23 | Turbid | 1,400 | 2+ | 1+ | 58 | 0 | 10,000 | |
| 4/16 | 24 | Turbid | 1,200 | 2+ | 1+ | 50 | 0 | 10,000 | |
| 4/18 | 20 | Turbid | 1,200 | 2+ | 1+ | 50 | 0 | 10.000 | |

* All the cells were polymorphonuclears.

and the rash disappeared within a week. On April 28, twenty days after the onset of illness, there was a rise in temperature, with spontaneous rupture of the left ear drum and congestion of the right. From this date to June 6 the course was characterized by a fluctuating temperature, occasional tenderness and edema over the tip of the left mastoid and cervical adenitis. Several otologists who observed the patient closely felt that mastoidectomy was not indicated.

On June 10 all aural and mastoid signs had disappeared, the temperature had reached normal and the general condition had improved. Four days later, however, it was noted that the child was vomiting frequently, was slightly drowsy and showed a preference for lying on the left side with the lower extremities in a position of flexion. There were lateral nystagmus, with deviation of the eyes to the right, haziness of both disks, questionable facial paralysis on the right side, moderate ataxia of the left arm, weakness of the left upper and lower extremities and no Brudzinski or Kernig reaction or alterations in the reflexes. A diagnosis was made of cerebellar abscess on the left side, and the patient was transferred to the service of Dr. E. J. Browder at the Long Island College Hospital. Dr. Browder performed a suboccipital craniotomy and located a cerebellar abscess on the left side, which he incised and drained. The patient was discharged as completely cured on July 16. No lumbar puncture was performed, because of the diagnosis of abscess of the brain.

COMMENT

The following types of meningeal irritation and meningeal infection may be observed in the course of scarlet fever:

*Serous Meningitis.*—This is really a meningeal reaction, due probably to scarlet fever toxins, manifested by a mild transitory meningeal syndrome. The spinal fluid is clear, sterile and increased in amount and pressure. The number of lymphocytes is normal or, occasionally, increased; albumin, globulin and sugar are normal in amount.

*Lymphocytic Meningitis.*—This type is accompanied by a more intense meningeal reaction. The cerebrospinal fluid is clear and under increased pressure; the cell count is from 50 to 1,500 (lymphocytes predominating); the albumin and the globulin are increased; the amount of sugar is normal, and bacteriologic examination of the fluid gives negative results.

*Sympathetic Meningitis.*—Acute suppurative conditions in the accessory sinuses, in the middle ear and mastoids and their related structures or in the brain may cause a reaction in the cerebrospinal fluid without the presence of actual meningitis. The fluid is turbid and on standing separates into a thick, purulent lower layer and a clearer supernatant fluid. No bacteria, however, are found on smear or culture. The fluid is increased in amount and pressure and in albumin and globulin content. Pleocytosis is present, generally manifested by an increase in polymorphonuclear leukocytes. Fehling's reaction is normal.

*Acute Suppurative Meningitis.*—This condition is characterized by turbidity of the cerebrospinal fluid, numerous polymorphonuclear cells, an increase in the albumin and the globulin content and a slight or no Fehling reaction. Streptococci are found on smear and culture.

Acute purulent meningitis with scarlet fever may be primary or secondary. The primary type is restricted to instances in which careful search during life or at postmortem examination fails to reveal any localized source of infection. It is exceedingly rare. In fact, it may be even rarer than the literature indicates, since involvement of the middle ear, sinuses or mastoids which failed to give clinical signs on the most careful examination during life may be observed post mortem. Goodall and Washbourn [1b] stated that they had never seen primary meningitis with scarlet fever. Ker [1c] mentioned only 1 authenticated instance, and Rolleston [1d] was able to collect only 8 cases in the literature. Zischinsky [2g] reported 8 examples of this type, but 2 may be discarded because the patient had purulent otitis media.

The pathways of invasion of the meninges in primary meningitis are: (1) through the nasopharynx and along the olfactory filaments by way of the cribriform plate of the ethmoid bone, (2) through the sphenoid

sinuses to the meninges, (3) by way of the blood stream or lymphatics and (4) according to some observers, through the choroid plexus, with the current of fluid that is constantly flowing through the foramina of Luschka and Magendie into the subarachnoid space.

Secondary purulent meningitis is usually associated with some localized infection. The channels of invasion of the meninges in this type of meningitis may be through the labyrinth or the tegmen tympani. The infection may also travel by way of the local lymphatics or blood capillaries without any visible continuity between the inflammatory focus and the meninges.

The following pathways of infection were found by Davis [10] in 13 autopsies in cases of otitic meningitis: 1. In 7 cases the pathway was traced through the fenestra ovalis to the labyrinth, the internal auditory meatus and the under-surface of the pons and then to the cisterna interpeduncularis. 2. In 1 case thrombosis was present in the lateral sinus, and a collection of pus around the sinus covered the under-surface and the posterior aspect of the cerebellar hemisphere. 3. In 1 case a collection of pus was found in the aqueduct of the vestibule. 4. In 4 cases no paths of infection were traceable.

In cerebral and cerebellar abscess, infections may travel by several pathways from the middle ear and mastoid to the temporal lobe and cerebellum. In general, it may be stated that the infection spreads from the tympanum and antral cavity by direct extension through the substance of the bone, with necrosis which may or may not involve the labyrinth or the sigmoid sinus in its course to the middle or the posterior fossa.

Our first case is an instance of proved streptococcic meningitis in which the hemolytic streptococcus of the scarlatinal group was isolated repeatedly on smear and culture from the spinal fluid. As the meningitis was associated with purulent otitis media, it is to be classified as secondary meningitis. The second case was one of purulent meningitis with scarlet fever in which gram-positive diplococci with a tendency to chain formation, interpreted as streptococci, were demonstrated in smears and cultures of the spinal fluid. The absence of a demonstrable focus of infection except the original disease, the occurrence of meningitis during the course of scarlet fever, the observation of Str. haemolyticus in the culture of material from the throat and the response to the specific serum therapy lead us to believe that this was an infection by the streptococcus of the scarlatinal group which may be classified as primary meningitis. In the first case of abscess of the brain the patient was admitted to the hospital as having acute meningitis, but the diagnosis was later changed to abscess of the brain with sympathetic meningitis on

10. Davis, E. D. J.: J. Laryng. & Otol. **38**:427, 1923.

the basis of the clinical findings, the absence of bacteria in smears and cultures of the spinal fluid and a positive Fehling reaction.

There is no specific therapy for suppurative meningitis. The various types which have been employed may be grouped as follows:

*Chemical Agents.*—Dyes such as acriflavine, mercurochrome and Pregl's iodine solution have been administered by intraspinal, intracisternal, intramuscular, intravenous and/or intracarotid routes. The last-mentioned route has been used with success in cases of purulent meningitis by Kolmer, Crawford and Ersner and Mendell.[11]

*Biologic Agents.*—Antiscarlatinal serum, scarlet fever antitoxin, polyvalent antistreptococcus serum and streptococcus bacteriophage have all been employed, the routes previously mentioned having been used.

*Blood Transfusions.*—Blood from an immune donor is preferable.

*Elimination of Demonstrable Source of Infection and Proper Drainage.*—This is obtained by various methods, such as mastoidectomy, labyrinthectomy, laminectomy, subdural drainage, cisternal drainage, lumbar puncture and ligation of the jugular vein. Watson-Williams[12] stated that in every case of meningitis with otorrhea the question of aural operation should be considered early, even before the spinal fluid becomes purulent. Kopetzky[13] and others advised early operation in cases of otitic meningitis with purulent spinal fluid.

It is difficult to state which method of therapy offers the best hope, but the recent increase in the number of patients who recover may be explained by the more general application of specific therapy. The prognosis, however, for both the primary and the secondary type of purulent meningitis still remains grave. For sympathetic meningitis the prognosis depends on the prompt eradication of the underlying factor. The prognosis for serous meningitis and that for lymphatic meningitis are good.

The treatment of cerebral and cerebellar abscess follows the general plans employed in cases of suppurative meningitis. The responsibility for the high mortality rate rests between incorrect diagnosis and improper decision as to the time of operation. Surgeons are not agreed

11. Kolmer, J.: Pneumococcus and Streptococcus Meningitis: Chemotherapy and Serum Therapy, with Special Reference to Newer Methods, J. A. M. A. **92**: 874 (March 16) 1929; Intercarotid Method of Treatment for Meningitis with Recoveries, ibid. **96**:1358 (April 25) 1931. Kolmer, J. A., and Rule, A.: J. Lab. & Clin. Med. **18**:1001, 1933. Crawford, A. S.: Intercarotid Treatment of Meningitis: Experiences with Pregl's Solution of Iodine; Further Report, J. A. M. A. **93**:1531 (April 30) 1932. Ersner, M. A., and Mendell, T. H.: Streptococcic Meningitis with Intercarotid Treatment and Recovery: Report of Two Cases, ibid. **99**:1596 (Nov. 5) 1932.

12. Watson-Williams, E.: Bristol Med.-Chir. J. **43**:91, 1926.

13. Kopetzky, S. J., and Almour, R.: Laryngoscope **39**:228, 1929.

as to the most feasible time for surgical intervention; some advise operation immediately after the diagnosis,[14] while others counsel a delay to permit encapsulation of the abscess.[15] Eagleton[16] stated that operation should be performed during the period of apparent quiescence, when there are slight signs of meningeal involvement and the inflammation is limited to an area adjacent to the principal focus of infection. Intervention during the acute stage may bring about an extension of the process and leptomeningitis, while too long a delay may result in suppurative cerebritis or rupture of the abscess into the subarachnoid space, with resulting diffuse purulent meningitis. The decision must be determined according to the findings in each case.

## SUMMARY AND CONCLUSIONS

Streptococcic meningitis is an infrequent complication of scarlet fever, with an incidence in the cases reported in the literature of less than 1 per cent. We report 15 additional cases; in 2 of these, 1 of the primary and the other of the secondary type, the patients recovered. The number of patients who have recovered from streptococcic meningitis with scarlet fever is brought up to 10, and the number who have recovered from meningitis with other diseases, to 77.

The various methods of therapy and procedure in cases of streptococcic meningitis and abscess of the brain are discussed, and the effect of specific therapy is stressed. Intensive treatment with large doses of antiscarlatinal serum is essential in the presence of meningitis with scarlet fever. Cerebral or cerebellar abscess with scarlet fever is much rarer than suppurative meningitis. We report 2 cases, with 1 recovery; both patients were operated on by trephining, incision and drainage.

All the patients in our series received combined antibacterial and antitoxic scarlet fever serum prepared under the direction of the New York City board of health. This was administered by the intramuscular, intravenous and intrathecal routes in all cases and by the intracisternal route also in 1. All the children who recovered are doing well at the time of writing.

Dr. Henry I. Fineberg, resident physician, assisted in the management of these cases.

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14. Dixon, O. J.: Brain Abscess as Otologist's Problem, J. A. M. A. **96**:481 (Feb. 14) 1931.

15. Grant, F. C.: The Mortality from Abscess of the Brain, J. A. M. A. **99**: 550 (Aug. 13) 1932. Lillie, W. I.: Surg., Gynec. & Obst. **47**:405, 1921. McKenzie, K. G.: The Treatment of Abscess of the Brain, Arch. Surg. **18**:1594 (April) 1929.

16. Eagleton, W. P.: Otitic Meningitis, J. A. M. A. **87**:1544 (Nov. 6) 1926.

# CHILDREN'S ELECTROCARDIOGRAMS

## I. MEASUREMENTS FOR ONE HUNDRED NORMAL CHILDREN

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Our purpose in undertaking this work is threefold: to establish trustworthy criteria for the normal electrocardiogram of the child, to determine how and to what extent the child's electrocardiogram deviates from the normal in the various types of heart disease (part II) and to compare the measurements of the child with those of the adult, for which accurate criteria are available.

### REVIEW OF THE LITERATURE

The first electrocardiographic study of children was made by Nicolai and Funaro,[1] in 1908. They recorded the standard lead I for 45 infants and children and noticed the frequent occurrence of a deep S wave in this lead. This finding they ascribed either to hypertrophy of the left ventricle or to a more transverse position of the infant's heart than of the adult's heart. However, they failed to mention whether all the children studied were normal.

The same finding of a deep S wave in lead I for infants was confirmed later in the same year by Heubner,[2] who in addition pointed out that the R wave in lead I for young children was low or absent. These studies would have been more valuable if the authors had followed the method recommended by Einthoven[3] and had recorded leads I, II and III.

One of the first comprehensive studies of children of different ages was made by Hecht,[4] in 1913. His group included 26 new-born infants,

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1. Nicolai and Funaro: Das Elektrokardiogram des Säuglings, Zentralbl. f. Physiol. **22**:58, 1908; cited by Hecht.[4]

2. Heubner, O.: Das Elektrokardiogram des Säuglings und Kindes, Monatschr. f. Kinderh. **7**:6 (April) 1908; cited by Hecht.[4]

3. Einthoven, F. R.: Le télécardiogramme, Arch. internat. de physiol. **4**:132, 1906; cited in Lewis.[5]

4. Hecht, A. F.: Der Mechanismus des Herzaktion im Kindesalter, Ergebn. d. inn. Med. u. Kinderh. **11**:324, 1913.

11 less than 1 year of age, 4 young children and 26 older children (aged from 6 to 13 years).

He confirmed Lewis'[5] and Funaro's[6] finding of a deep S wave in lead I but did not wholly agree with the latter as to the cause. He stated that the transmission time is shorter for children than for adults. He included valuable tables giving the measurements of the electrocardiographic deflections and intervals, especially in lead I. He included a study of 300 abnormal children and carefully stated the clinical abnormality of each.

In 1916 Krumbhaar and Jenks[7] made a study of the electrocardiograms of 42 normal children. Besides the frequent occurrence of $S_1$,[8] they found relatively large Q waves in leads II and III. They regarded both these phenomena as evidence of activity of the right ventricle, in agreement with the explanation given by Lewis[5] a short time before. They noticed that the PR interval was shorter for children than for adults even when allowance was made for the more rapid rate of infants. $T_3$ was frequently inverted and was always the lowest T wave in all three leads. However, their paper represents a study of infants rather than of older children, since 33 of their subjects were under 5 years of age.

Seham[9] in 1921 published studies of new-born infants, of infants under 1 year of age and of 36 children aged from 2 to 13 years. He repeated the investigations of previous authors, measuring the height of the individual deflections in each lead as well as the time relations of the various intervals and phases of the cardiac cycle.

In 1928 Lincoln and Nicolson[10] made a more detailed study along the same lines as Seham's but in addition stressed the differences between the electrocardiograms of boys and those of girls and the familial resemblances in electrocardiograms. Their study included 222 normal school children.

In 1931 Perry[11] studied the electrocardiograms of 100 normal children, 50 of whom were aged 10 years, but failed to carry his investi-

5. Lewis, Thomas: The Mechanism and Graphic Registration of the Heart Beat, ed. 3, London, Shaw & Sons, Ltd., 1925.

6. Funaro, R.: L'elettro-cardiogramma del l'adulto e del bambino, Riv. di clin. pediat. **8**:480 (June) 1910; cited by Hecht.[4]

7. Krumbhaar, E. B., and Jenks, H. H.: Electrocardiographic Studies in Normal Infants and Children, Heart **6**:189, 1917.

8. $S_1$ indicates the S wave in lead I.

9. Seham, M.: Electrocardiogram in Normal Children, Am. J. Dis. Child. **21**:247 (March) 1921.

10. Lincoln, E. M., and Nicolson, S. H. B.: The Hearts of Normal Children: III. Electrocardiographic Records, Am. J. Dis. Child. **35**:1001 (June) 1928.

11. Perry, C. B.: Electrocardiograms of Normal Children, Arch. Dis. Childhood **6**:259, 1931.

gations far. Prior to making a study of electrocardiograms of children with infectious diseases Shookhoff and Taran [11a] studied the electrocardiograms of 259 normal children between the ages of 6 and 14 years. They found the average PR interval for this group to be 0.12 second and the QRS complex 0.051. McGinn and White [12] in 1934 measured the duration of the QRS complex in the normal and the abnormal electrocardiogram and in the study included 50 normal children.

Burnett and Taylor [12a] in 1936 made a study of 1,276 electrocardiograms of 167 healthy children ranging in age from 3 weeks to 12 years. They found the transmission time to be shorter in the child than in the adult, the PR and the QRS intervals for the children under 8 years averaging 0.126 and 0.0549 seconds, respectively.

When discussing the results of our studies, we shall refer in detail to the findings of these authors.

## METHOD

All the electrocardiograms used in this study were made on a Hindle electrocardiograph [13] at the Heart Station of the Charity Hospital. They were obtained over a period of ten years, and most of them were recorded by one of us personally. The three standard leads were taken in every instance. The older children were allowed to sit in a comfortable chair, and contacts were made by placing the right hand, the left hand and the left foot in containers of warm sodium chloride solution. With the younger children, because of the difficulty of using the method described, the galvanometer connections were made by wrapping the wrists and the left ankle with soft cloth wet with the solution. The contacts were copper wires placed over the cloth. The younger children usually lay on the back.

Each child was carefully examined, usually by two physicians, to determine whether or not the heart was normal and in the case of an abnormality to decide on the type of disease. Histories were taken by us, either from the child, if old enough, or from a relative.

From about 1,200 children the following groups were selected: 100 normal children, 100 children with rheumatic heart disease of the various types and 50 children with congenital heart disease. The normal children were clinically free from heart disease and as far as could be detected had no history of any disease which might cause heart trouble. Of the abnormal children, only those with a clearcut condition were selected. In the selection of children, the electrocardiograms were also noted, and any showing instrumental artefacts were discarded. All the electrocardiograms were standardized, 1 millivolt equaling 1 cm.

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11a. Shookhoff, C., and Taran, L. M.: Electrocardiographic Studies in Infectious Diseases, Am. Heart J. **6**:541, 1931.

12. McGinn, S., and White, P. D.: The Duration of the QRS Complex in the Normal and in the Abnormal Electrocardiogram, Am. Heart J. **9**:642, 1934.

12a. Burnett, C. T., and Taylor, E. L.: Electrocardiograms on 167 Average Healthy Infants and Children, Am. Heart J. **11**:185, 1936.

13. Made by the Cambridge Instrument Company.

FINDINGS FOR NORMAL CHILDREN

*Age and Sex.*—The 100 normal children included 40 white boys, 32 white girls, 8 Negro boys and 20 Negro girls. Thus there was almost an equal incidence of the two sexes: 48 boys and 52 girls. The ages ranged from 3 days to 14 years. The arithmetical mean age for the group was 9.16 years, the boys averaging 9.94 years and the girls 8.53 years. The true ages were probably about 4 months higher.

*The Heart Rate.*—The heart rate ranged from 52 to 164 beats per minute, the average for the group being 92.7. The mean for the girls, 95.3, was slightly higher than that for the boys, 89.9. There is a general tendency for the rate to decrease with increasing age, although the range at every age is wide. A certain variation at each age is to be expected, but perhaps if we had obtained basal rates the variation would have been less. This fluctuation in rate has no important bearing on the electrocardiographic results.

*The P Wave.*—The width of the P wave, measured in the lead where P was widest, for our 100 normal children ranged from 0.04 to 0.09 second, the upper limit being found in only 1 case, that of a Negro girl aged 12 with a heart rate of 68. In all the other cases it measured 0.08 second or under. The average duration was 0.062 second, a figure which is about 0.02 second less than the average for normal adults.

On examining the direction of the P wave, we found it upright in every case in leads I and II. In lead III it was also upright, except in 4 cases, and in none of these did the inversion exceed 0.5 mm. Two diphasic P waves in lead III were found, both of the ± type. Perry [11] found $P_3$ inverted in 8 per cent of his series. Lincoln and Nicolson [10] found that in 3.2 per cent of their cases there was a constantly inverted $P_3$, in 1.8 per cent a constantly diphasic $P_3$ and in 2.8 per cent an occasionally diphasic $P_3$. Seham found two inverted or diphasic $P_3$ waves in 36 children.

The height of $P_1$ ranged from 0.2 to 1.5 mm., the arithmetical mean being 0.705 mm. $P_2$ ranged from 0.2 to 2.7 mm. and averaged 1.31 mm. (when the cases in which $P_3$ was inverted or iso-electric were included). $P_3$ ranged from —0.5 to 1.5 mm., the mean being 0.588 mm. It is to be noted that the sum of the mean heights of $P_1$ and $P_3$ nearly equals the height of $P_2$. These values are considerably lower than those given by Perry,[11] Lincoln and Nicolson [10] and Seham,[9] especially for lead I. Perry found the average height of $P_1$ and of $P_2$ to be 1.2 mm. and 1.5 mm., respectively. The largest $P_1$ recorded was 2.5 mm., and the largest $P_2$, 5 mm. In a search through 1,200 electrocardiograms of children, both normal and abnormal, we were unable to find a single $P_2$ of 5 mm. Lincoln and Nicolson's averages for the

different age groups ranged from 1 to 1.6 mm. for lead I, from 1.4 to 2.1 mm. for lead II and from 0.8 to 1.4 mm. for lead III. There is doubt regarding the accuracy of the measurements because of the fact that the average heights of $P_1$ and of $P_3$ for the different age groups do not equal the average heights of $P_2$ and because of the great (abnormal) heights recorded for the P waves, especially in lead I. Seham [9] gave the average height of $P_1$ of 36 children aged from 2 to 13 years as 1 mm. and that of $P_2$ as 1.5 mm. In Hecht's [4] table for calculating the *Vorhoffquotient* (the relation of $P_1$ to $R_1$ or to the sum of $R_1$ and $S_1$), values for $P_1$ are given for 30 children ranging in age from 4½ months to 13½ years. The average of these values we found to be 0.79 mm., a figure which more closely approximates our own.

A comparison of the heights of the P wave of 48 normal adults with those of children is given in the following tabulation:

| | 100 Adults, Mm. | 100 Children, Mm. |
|---|---|---|
| $P_1$ | 0.550 | 0.705 |
| $P_2$ | 1.355 | 1.313 |
| $P_3$ | 0.793 | 0.588 |

From this tabulation one sees that while $P_2$ is slightly higher on the average for adults than for children and that $P_1$ for children tends to be slightly higher than $P_3$, for adults the reverse is true. Lincoln and Nicolson found that $P_1$ was higher than $P_3$ for children, but Seham found the opposite to be true.

There was no abnormal notching of the P wave in any lead. $P_2$ was slightly notched in 7 cases and $P_1$ and $P_3$ in 1 case each. For his entire series of normal children, Hecht reported that the electrocardiogram of only 1 new-born child showed a definite notching of $P_1$ and $P_3$. Ashman and Hull [14] found a slight notching, usually in lead II, for 32 per cent of their normal adults.

*The PR (PQ) Interval.*—In every case we measured the interval from the beginning of the P wave to the beginning of the first QRS deflection, either P or Q. The longest PR of the three leads was chosen.

The range of the PR for our 100 normal children was from 0.1 to 0.165 second. Only one PR measured over 0.16 second, and it was found in a white boy aged 12 whose heart rate was 57. The average for the whole group was 0.132 second, that for the boys being 0.135 and that for the girls being 0.13 second. We attribute this difference to the facts that the boys were a little older than the girls and that their average heart rate was a little slower.

14. Ashman, R., and Hull, E.: Essentials of Electrocardiography, New York, The Macmillan Company, 1937.

When we divided the group on the basis of age, we obtained the following averages:

| Age, Years | PR Interval, Seconds | Number |
|---|---|---|
| 0—5 | 0.124 | 17 |
| 6—9 | 0.130 | 32 |
| 10—12 | 0.135 | 33 |
| 13—14 | 0.141 | 18 |

The slight discrepancy between the number of children in each age group in this and in subsequent tables is due to the inadvertent inclusion of a child of 9½ or of 12½ years sometimes in one group and sometimes in another.

Our average PR was considerably shorter than that given by Perry, 0.148 second in lead II. It agrees more closely with that of Lincoln and Nicolson (0.136 second). Seham's average for children aged from 1 to 5 years was 0.123 and for children aged from 6 to 13 years 0.138 second. His upper limit for older children was 0.18 second, as against ours of 0.165. Krumbhaar and Jenks stated that for children aged from 5 to 15 years the PR varies from 0.12 to 0.16 second. They found a gradual increase in length of the PR with increasing age during the first year and a half of life, but they did not have enough data on older children to obtain statistically significant averages.

Hecht gave a figure of 0.13 second for younger children (from 17 months to 4½ years) and of 0.14 second for older children (from 6½ to 13½ years).

Ashman and Hull found the average PR for 100 normal adults to be 0.15 second, which is longer than our interval for children; this finding is due to the greater size of the heart in the adult.

*The QRS Group.*—We found the average QRS for our group to be 0.065 second, that for the boys being 0.067 and that for the girls 0.063. We have on record a case such as those described by Wolff, Parkinson and White [15] and also a case of atypical right bundle branch block, which is occasionally found in normal persons, but these were excluded in the selection of cases because, although there was no clinical evidence of heart disease, the pictures are atypical or abnormal.

The QRS both for boys and for girls was found to increase slightly with increasing age. This is shown in the following tabulation:

| Age, Years | Boys, Second | Girls, Second | Both, Second | Frequency |
|---|---|---|---|---|
| 0—5 | 0.593 | 0.625 | 0.612 | 17 |
| 6—9 | 0.653 | 0.621 | 0.634 | 31 |
| 10—12 | 0.675 | 0.642 | 0.637 | 34 |
| 13—14 | 0.734 | 0.653 | 0.706 | 18 |

15. Wolff, L.; Parkinson, J., and White, P. D.: Bundle-Branch Block with Short P-R Interval in Healthy Young People Prone to Paroxysmal Tachycardia, Am. Heart J. **5**:685, 1930.

The range for the QRS was from 0.05 to 0.09 second; in 2 cases it measured 0.09 second.

Lincoln and Nicolson found an average QRS of 0.06 second and no significant difference in the averages for the various age groups. Seham's average for children from 1 to 5 years old was 0.049 second and for older children 0.069 second. The figure computed by McGinn and White [12] in their recent study of 50 normal children was considerably higher than ours, 0.0719 second.

As would be expected from the difference in body size, the QRS for adults is wider than that for children, Ashman and Hull's [14] figure being 0.077 second and that of McGinn and White 0.0777 second. Both studies gave a smaller average for women than for men and attribute this difference to the fact that the hearts of women are smaller.

In 100 normal children we found one case, that of a white boy aged 12, in which the voltage of the QRS was low. The highest deflection of the QRS measured 5 mm. ($R_2$), and the remaining deflections of the three leads were lower.

*The Q Wave.*—The Q wave, including that in cases in which Q was zero, averaged as follows:

| | $Q_1$, Mm. | $Q_2$, Mm. | $Q_3$, Mm. |
|---|---|---|---|
| Boys | 0.32 | 0.29 | 0.41 |
| Girls | 0.27 | 0.33 | 0.55 |

*The R Wave.*—We found the average height of the R wave in lead I to be 6.20 mm., the mean for the boys (6.26 mm.) being slightly higher than that for the girls (6.15 mm.). The range of the R wave in this lead was from 0.5 to 15 mm.

In lead II the R wave averaged 11.55 mm., the range being from 0.5 to 22 mm., but the mean for the girls (11.61 mm.) was slightly higher than that found for the boys (11.49 mm.). Our average height of $R_2$ (which is usually the highest R wave in the electrocardiograms of children) is not significantly higher than the average of the highest R of the three leads of normal adults as given by Ashman and Hull.[14]

The average height of $R_3$ was 6.36 mm., the mean for boys being 6.31 mm. and that for girls 6.40 mm.

Seham and Lincoln and Nicolson found the R waves for children to be much higher than those for adults. On the other hand, Linetzky [16] found the R wave to increase with age and with the size of the heart, his averages for a series of 300 adults being from 11 to 14 mm.

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16. Linetzky, S.: Die Beziehung der Form des Elektrokardiograms zu dem Lebensalt der Herzgrosse und dem Blutdruck, Ztschr. f. exper. Path. u. Therap. **9**:699, 1911; cited by Lincoln and Nicolson.[10]

*The S Wave.*—The averages of the S wave in each lead are as follows:

| | $S_1$, Mm. | $S_2$, Mm. | $S_3$, Mm. |
|---|---|---|---|
| Boys | 1.79 | 2.20 | 1.11 |
| Girls | 1.50 | 1.25 | 0.62 |

No abnormal slurring of the R or of the S wave was observed in any lead. A slight slurring was present in 20 cases, most frequently of the R wave in lead II. In 5 cases the $R_3$ was notched. In 2 of these cases the amplitude of the R was 5 mm., in 2 cases, 7 mm., and in 1 case, 10 mm. In 1 case an $R_1$ of 5 mm. was found to be notched. In 1 case the electrocardiogram showed a wide, slurred $S_1$ of the atypical right bundle branch block type which is occasionally recorded from apparently normal hearts. There was no slurring of the Q waves.

*The Electrical Axis.*—The average electrical axes were calculated from the chart devised by Dieuaide.[17] With the exception of those in 3 cases, the electrical axes for our series of normal children lay between 20 and 104 degrees. One axis of 120 degrees was found in a 3 day old baby, a finding which was to be expected from the numerous reports of predominance of the right ventricle in infants. A definite left axis deviation (electrical axis — 15 degrees) was found in a white boy aged 9, with an $S_2$ of 5 mm. and an $S_3$ of 6 mm., $R_1$ being 7 mm. The third case was that of a Negro girl, aged 12, whose electrical axis measured 9 degrees.

The arithmetical mean (including the measurements in these 3 cases) was 61.33 degrees, the axes observed for the boys averaging 59.1 degrees, and those observed for the girls, 61.9 degrees. Excluding the 3 day old baby with the extreme predominance of the right ventricle, we found a slight increasing tendency to right axis deviation with increasing age, probably due to the increase in the length of the chest during this period of growth.

| Age | Boys | Girls | Both | Number of Cases |
|---|---|---|---|---|
| 9 mo.— 5 yr. | 49.1° | 53.4° | 51.5° | 16 |
| 6 yr. — 9 yr. | 55.3° | 63.1° | 59.7° | 32 |
| 10 yr. —12 yr. | 62.6° | 61.6° | 62.0° | 32 |
| 13 yr. —14 yr. | 65.2° | 70.3° | 67.0° | 17 |

In 222 cases, Lincoln and Nicolson found 3 cases of definite predominance of the right ventricle (according to Einthoven's classification) and 8 cases of definite predominance of the left ventricle. These variations they attributed to some peculiarity in the arrangement of the intraventricular conducting system. Perry found the average electrical axis to be 56.6 degrees for his series of normal children.

17. Dieuaide, F. R.: The Determination and Significance of the Electrical Axis of the Human Heart, Arch. Int. Med. **27**:588 (May) 1921.

*The RS-T Segment.*—In 9 cases the RS-T segment was shifted upward slightly, in 7 in lead II and in 1 each in leads I and III. All these shifts were under 1 mm., most of them being 0.5 mm. In 1 case RS-$T_2$ was shifted downward slightly (0.75 mm.).

*The T Wave.*—$T_1$ ranged in height from 0.8 to 5 mm., the mean being 2.18 mm. The mean for the boys, 2.29 mm., was slightly higher than that for the girls, 2.09 mm. No inverted or diphasic T waves in lead I were noted.

$T_2$ ranged from 0.5 to 9 mm. and averaged 2.41 mm. The mean for the boys was 2.59 mm. and that for the girls 2.18 mm. There were no inversions of $T_2$, but one slightly diphasic $T_2$ of the $\mp$ type was found for a white girl aged 14 whose $T_3$ was inverted and whose $T_1$ only slightly exceeded 1 mm.

The average $T_3$ for girls was 0.02 mm. and that for boys 0.3 mm. (when cases in which it was inverted were included).

| | $T_1$, Mm. | $T_2$, Mm. | $T_3$, Mm. |
|---|---|---|---|
| Boys | 2.29 | 2.59 | 0.30 |
| Girls | 2.09 | 2.18 | 0.02 |
| Both | 2.18 | 2.41 | 0.16 |

The T waves averaged higher for boys than for girls. This difference cannot be attributed to the difference in age between the boys and the girls in our series. The difference according to sex probably persists in adult life. As is shown in the following table, age seems to have no relation to the height of the T waves, whereas at each age level except that of the small group from birth to 5 years old the boys' T waves averaged higher than the girls'.

Amplitude of $T_2$ at the various age levels:

| | Birth to 5 yr., Mm. | 6 to 9 yr., Mm. | 10 to 12 yr., Mm. | 13 to 14 yr., Mm. |
|---|---|---|---|---|
| Boys | 2.36 | 2.43 | 3.13 | 2.37 |
| Girls | 2.87 | 1.83 | 2.46 | 1.38 |

This difference according to sex was reported by Lincoln and Nicolson.

In only 1 case was $T_1$ lower than $T_3$, and this was in a case in which the electrical axis was about 75 degrees. $T_1$ was equal to $T_3$ in 3 cases, in 1 of which there was a slight left axis deviation, in 1 of which there was a slight right axis deviation and in one of which the axis deviation was normal.

$T_3$ was inverted for 38 per cent of our normal children and diphasic for 7 per cent. The electrocardiograms of the girls showed a slightly higher incidence of the inversion of $T_3$, but the extent of the inversion was greater for the boys. For every girl, the depth of the negative $T_3$ was less than 1 mm., whereas for 2 boys the inversion was 1.5 mm.

For 2 of our 100 normal children, we found the highest T wave of the three leads to be only 1 mm. One of these cases was the same as that in which the $T_2$ was diphasic. In no case did notching of the T wave occur.

Lincoln and Nicolson's averages for the heights of the T waves were on the whole higher than ours. Krumbhaar and Jenks found T the lowest in lead III. Seham reported an average height of $T_1$ and of $T_2$ which was considerably greater than ours, 3.4 mm. and 3.5 mm., respectively. Hecht's figures for the height of $T_1$ give an average of 1.63 mm. Ashman and Hull found the average height of $T_1$ for 100 normal adults to be 1.7 mm., that of $T_2$ to be 2.2 mm. and that of $T_3$ to be 0.4 mm. (when cases in which the wave was inverted or iso-electric were included).

Perry found $T_3$ inverted in 54 per cent of his cases. Seham reported $T_3$ inverted for 15 per cent of his normal children, while Lincoln and Nicolson found a much higher incidence, 35.5 per cent. The majority of these figures seem to indicate that $T_3$ is much more frequently inverted in the electrocardiograms of children than in those of normal adults. Ashman and Hull found $T_3$ inverted for 20 per cent of their normal adults and diphasic or iso-electric for another 10 per cent.

*The QT Interval.*—The QT interval extends from the beginning of the QRS complex to the end of the T wave. Its duration varies greatly with the length of the cardiac cycle, being long when the heart rate is slow and short when the heart rate is rapid.

In measuring this interval we were always careful to include the width of the Q wave, however small, and to make the measurement in the lead where T was highest. The average of several cycles was always taken, especially in cases of sinus arrhythmia.

Our shortest QT interval measured 0.22 second and was found in the electrocardiogram of a Negro boy aged 1 year whose rate was the fastest of our entire group (164 beats per minute). Our longest QT, 0.44 second, was recorded from one of the slowest hearts, which had a rate of 57 beats per minute. The average for the group was 0.325 second.

To compare intelligently the length of the QT for the two sexes it was necessary to correlate each interval with the heart rate. Bazett [18] reported a constant relation between the duration of electrical systole (QT) and the square root of the length of the cycle. He gave the empirical formulas relating the two as: $S = 0.37 \sqrt{c}$ for men and $S = 0.40 \sqrt{c}$ for women. After a careful study of the same subject, Ashman came to the conclusion that Bazett's constant for men was too

18. Bazett, H. C.: An Analysis of the Time Relations of Electrocardiograms, Heart **7**:353, 1920.

low at all rates and that for women the formula gave values which were too low when the heart rate was rapid and too high when the heart rate was slow. From measurements made on 180 adult males, 180 adult females and 82 children he devised the following formulas:

$$\text{Women} \ldots\ldots\ldots\ldots \quad QT = 0.385 \times \log\ 10\ (c + 0.07)$$
$$\text{Men and children} \ldots\ldots \quad QT = 0.375 \times \log\ 10\ (c + 0.07)$$

On comparing the QT's of our normal children with those calculated by the second formula above, we found only slight deviations from the predicted normal values for the rate. The average deviation for the girls was —0.0011 second and that for the boys +0.0014 second. This slight and insignificant difference according to sex for children is opposite to that found by Bazett for adults. We found no support for the assumption made by Perry that the difference according to sex extends to children.

From their study of the range of normal QT intervals at the different heart rates, Ashman and Hull also formulated a table for the upper limits of the normal QT interval at various rates. In our electrocardiograms of 100 normal children, the intervals of only 4 boys reached or exceeded this upper limit. The intervals of only 1 girl reached the upper limit, and those of 1 girl exceeded it.

*Arrhythmias.*—Aside from the frequent occurrence of sinus arrhythmia, disturbances of the cardiac mechanism were rare. One instance of auriculoventricular nodal rhythm was found, in a Negro girl aged 11 years with a rate of 76 beats per minute. One white boy aged 14 showed frequent ventricular premature beats with no other abnormal finding. A diagnosis of septic tonsils had been made, but the irregularity persisted for two years after tonsillectomy. The child had also suffered from a streptococcic infection of the leg. Frequent auricular ectopic beats were observed in a white girl aged 12.

Perry [11] reported the recording of a single ventricular extrasystole, the subject being a boy aged 13, in his study of 100 normal children. Hecht [4] noted the rarity of extrasystole in childhood, and in every instance in which he found premature beats he was able to demonstrate a background of clinical disturbance.

## SUMMARY AND CONCLUSIONS

To establish trustworthy criteria for the normal electrocardiogram of the child, electrocardiograms of 100 normal children were selected and the heights of the individual deflections in each lead as well as the time relations of the various intervals and phases of the cardiac cycle were carefully measured.

The duration of the P wave was found to average 0.062 second. The upper limit we would consider to be 0.09 second or perhaps 0.085 second, since a P wave measuring 0.09 was found in only 1 case.

Since the height of the P wave in lead I was slightly higher than the average for the normal adult, the upper limit should be placed at about 1.5 mm. or a little lower. A $P_2$ measuring over 2.5 mm. should be considered above the normal.

A diphasic or slightly inverted $P_3$ is occasionally found in the electrocardiogram of a normal child.

Slight and questionable notching of the P wave is occasionally seen, but no definite or conspicious notching of the P wave is found in the electrocardiogram of a normal child.

The average PR for our series was 0.132 second, and there was no significant difference according to sex. We found that the PR interval tended to increase with increasing age and to decrease with increasing heart rate. We believe that instead of setting one definite figure for the upper limit of normal for children's electrocardiograms it would be a better plan, if sufficient data were available, to secure a statistically significant average for each age and heart rate and to construct a table giving the upper limits of the PR at the various ages and heart rates. If a more reliable approximation of the size of the heart were available (perhaps the surface area, as suggested by Kissane [19]), this could be used in the table instead of the age.

The average duration of the QRS group was 0.065 second. The QRS showed an increase in duration with the increase in age. We agree with other authors in placing the upper limit for duration of the QRS for children at 0.09 second, or at less for young children and infants.

QRS of low voltage was found in only 1 of 100 electrocardiograms of normal children.

There is no great difference between the heights of the R wave for children and those for the R wave of adults. We found the average to be slightly higher for children. Other authors have found it much higher and others lower.

Slight slurring of the deflections of the QRS may be found, frequently of the R wave in lead II, but definite or conspicuous slurring is almost never found in an electrocardiogram of a normal child.

The electrical axis in all but 3 cases lay between 20 and 104 degrees, ranging from a slight left axis deviation to a slight right axis deviation.

Slight shifting of the RS-T segment, especially upward, is occasionally seen in a normal child's electrocardiogram.

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19. Kissane, R. W.: Area of the Body Surface and Measurement of the Normal Heart in Children, Arch. Int. Med. **45**:241 (Feb.) 1930.

The T waves consistently averaged higher for the boys than for the girls, even when the data were separated according to the various age groups. We have no explanation of this difference. It will be seen in Part II that this difference according to sex is also found in the electrocardiograms of children with heart disease.

$T_3$ is frequently inverted or diphasic in the electrocardiogram of the normal child.

Low T waves were found in only 1 case, and the normality of this picture should be doubted, since $T_2$ was slightly diphasic. No notched T waves were found.

Like many previous investigators, we found the QT to vary with the heart rate, but we found no difference according to sex, such as is found in the electrocardiograms of adults.

Premature beats are rare in children with normal hearts.

# CHILDREN'S ELECTROCARDIOGRAMS

## II. THE CHANGES IN CHILDREN'S ELECTROCARDIOGRAMS PRODUCED BY RHEUMATIC AND CONGENITAL HEART DISEASE

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### RHEUMATIC HEART DISEASE

Many of the first electrocardiographic studies that were carried out (Butterfield,[1] White [2] and Emanuel [3]) emphasized the disturbance in conduction which appeared during the course of rheumatic fever. In addition to defects in conduction, Cohn and Swift [4] pointed out the changes in the ventricular complex produced by rheumatic fever. They followed the course of the disease closely, taking 2,591 electrocardiograms in 37 cases. Shortly afterwards White and Burwell [5] pointed out the incidence of predominance of the right ventricle and prominent P waves with rheumatic mitral stenosis. In 1926 Bain and Hamilton [6] studied 50 children, aged from 4½ to 14, some of whom showed only rheumatic carditis and others valvular lesions in addition. Their paper does not give a true idea of either the frequency or the extent of defects in conduction with these conditions in children because they neglected to give the measurements of the PR interval and because the standards

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1. Butterfield, H. C.: Acute Carditis and Heart Block, Heart **3**:203, 1911-1912; cited in Bain, D. W. C., and Hamilton, C. K.: Electrocardiographic Changes in Rheumatic Carditis, Lancet **1**:807 (April 17) 1926.

2. White, P. D.: Acute Heart Block Occurring as the First Sign of Rheumatic Fever, Am. J. M. Sc. **152**:598, 1916.

3. Emanuel, J. C.: On a Case of Heart Block, Lancet **1**:856, 1910.

4. Cohn, A. E., and Swift, H. F.: Electrocardiographic Evidence of Myocardial Involvement in Rheumatic Fever, J. Exper. Med. **39**:1, 1924.

5. White, P. D., and Burwell, C. S.: The Effect of Mitral Stenosis, Pulmonic Stenosis and Hypertension on the Electrocardiogram, Arch. Int. Med. **34**:529 (Oct.) 1924.

6. Bain, D. W. C., and Hamilton, C. K.: Electrocardiographic Changes in Rheumatic Carditis, Lancet **1**:807 (April 17) 1926.

they used were those for adults, which were too high. Levy and Turner [7] in 1929 stated that disturbances in conduction are found more frequently with rheumatic heart disease than with any other type of heart disease and that defective auriculoventricular conduction is found more frequently than heart block. Shapiro [8] studied children and young adults who had apparently recovered from the acute stages of rheumatic fever and found electrocardiographic changes similar to those recorded during the acute stage of the disease. Using a method similar to that employed by Seham [9] and Lincoln and Nicolson [10] in studying normal children and using their figures for comparison, Weiss [11] in 1931 studied the electrocardiograms of 87 children aged from 5 to 15 years with chronic rheumatic heart disease. After many investigations of the factors affecting the length of the QT interval (Buchanan,[12] White and Mudd [13] and Fenn [14]), Berlinger [15] first mentioned rheumatic valvular disease as one of the foremost of the factors. He found prolonged QT intervals most frequently with hypertensive heart disease and next most frequently with rheumatic valvular disease.

Many other individual cases have been reported, but apparently no further statistical studies have been made in this field.

### CONGENITAL HEART DEFECT

As far as we have been able to ascertain in a careful survey, no comprehensive studies of the electrocardiographic findings in cases of congenital heart disease have been made. In most texts on electro-

7. Levy, R. L., and Turner, K. B.: Impaired Auriculoventricular Conduction in Rheumatic Fever, Arch. Int. Med. **43**:267 (Feb.) 1929.

8. Shapiro, M. J.: Electrocardiographic Changes in Quiescent Rheumatic Fever, Am. Heart J. **5**:504, 1930.

9. Seham, M.: Electrocardiogram in Normal Children, Am. J. Dis. Child. **21**:247 (March) 1921.

10. Lincoln, E. M., and Nicolson, G. H. B.: The Hearts of Normal Children, Am. J. Dis. Child. **35**:1001 (June) 1928.

11. Weiss, Morris M.: The Electrocardiogram in Children with Chronic Rheumatic Heart Disease and Heart Failure, Am. J. Dis. Child. **42**:1339 (Dec.) 1931.

12. Buchanan, J. A.: A Study of the S-T Interval in 1,028 Electrocardiograms, Arch. Int. Med. **28**:484 (Oct.) 1921.

13. White, P. D., and Mudd, S. G.: Observations on the Effect of Various Factors on the Duration of the Electrical Systole of the Heart as Indicated by the Length of the Q-T Interval of the Electrocardiogram, J. Clin. Investigation **7**:387, 1929.

14. Fenn, G. K.: Studies in the Variation in the Length of the Q-R-S-T Interval, Arch. Int. Med. **29**:441 (April) 1922.

15. Berlinger, Kurt: Observations on the Duration of the Electrical Systole of the Heart, with Special Reference to the Effect of Digitalis, Am. Heart J. **7**:189, 1931.

cardiography and heart disease, the occurrence of extreme predominance of the right ventricle in congenital pulmonary stenosis is emphasized.

Hecht [16] studied 9 cases of congenital heart disease, the specific type of anomaly being undiagnosed, and mentioned the frequency of a deep S wave in lead I in the electrocardiograms. In 1924 White and Burwell [5] mentioned the incidence of predominance of the right ventricle in pulmonary stenosis and also stated that in all cases either $P_1$ exceeded 1 mm. or $P_2$ exceeded 2 mm. in height. Pardee [17] expressed the belief that a good many hearts with congenital defects are affected by changes in the auriculoventricular conduction system which result in variations in the duration and the notching of the QRS group. Roesler [18] in 1934 examined the electrocardiograms in 5 cases of interatrial septal defect. In 1 case he found extreme right axis deviation and in the other 4 moderate right axis deviation.

It is generally believed that the characteristic electrocardiographic changes in cases of pulmonary stenosis are extreme predominance of the right ventricle, the P waves usually being high but not wide; that patency of the interventricular septum is occasionally accompanied by unusual changes in the QRS group, and that patency of the ductus arteriosus is unassociated with electrocardiographic abnormalities.

## METHOD AND MATERIAL

The methods of collecting and tabulating data were described in Part I.

The group with rheumatic conditions consisted of 25 children with rheumatic carditis, care having been taken to choose children with fever, pains in the joints and 50 children with other symptoms, rheumatic mitral stenosis and insufficiency, 10 with rheumatic aortic regurgitation and 15 with mitral stenosis and insufficiency with aortic regurgitation.

In the group with congenital heart disease there were 25 children with pulmonary stenosis, either uncomplicated or with other defects, some of which were tetralogy of Fallot (pulmonary stenosis, patent interventricular septum, dextroposition of the aorta and hypertrophy of the right ventricle); 15 children with interventricular septal defect, and 10 with patent ductus arteriosus.

## THE RHEUMATIC GROUP

*Age and Sex.*—The 100 children with rheumatic heart disease included 39 white boys, 25 white girls, 12 Negro boys and 24 Negro girls. As in the normal group, the incidence of the two sexes

16. Hecht, A. F.: Der Mechanismus des Herzaktion im Kindesalter, Ergebn. d. inn. Med. u. Kinderh. **11**:324, 1913.

17. Pardee, Harold E. B.: Clinical Aspects of the Electrocardiograms, ed. 3, New York, Paul B. Hoeber, Inc., 1933.

18. Roesler, H.: Interatrial Septal Defect, Arch. Int. Med. **54**:339 (Sept.) 1934.

was almost equal, there being 51 boys and 49 girls. The children on the whole were a little older than those in the normal group, the average age being 9.88 years, and the distribution was as follows:

| Age, Years | Frequency |
|---|---|
| 2 | 1 |
| 3 | 1 |
| 4 | 0 |
| 5 | 3 |
| 6 | 7 |
| 7 | 8 |
| 8 | 10 |
| 9 | 14 |
| 10 | 11 |
| 11 | 12 |
| 12 | 16 |
| 13 | 9 |
| 14 | 8 |
| | 100 |

*The Heart Rate.*—The average heart rate for the rheumatic group was 100.2 beats per minute, being slightly higher than that for the normal children in spite of the higher age level.

*The P Wave.*—Width: The arithmetical mean for the width of the P wave in the electrocardiograms of rheumatic children was 0.076 second, which is 0.014 second above the normal average of 0.062 second. In 17 per cent of the cases the measurement fell beyond the normal upper limit (0.09 second), and in an additional 5 per cent it reached that figure.

The means and ranges for the four divisions of the rheumatic group were as follows:

| | Mean, Second | Range, Second | No. of Cases |
|---|---|---|---|
| Acute rheumatic carditis | 0.0696 | 0.055–0.10 | 25 |
| Rheumatic mitral stenosis and insufficiency | 0.0776 | 0.055–0.12 | 50 |
| Rheumatic aortic regurgitation | 0.0875 | 0.060–0.13 | 10 |
| Rheumatic mitral stenosis, insufficiency and aortic regurgitation | 0.0723 | 0.050–0.09 | 15 |

Weiss [11] found the average duration of the P wave in lead II to be 0.09 second and in lead III to be 0.08 second for his rheumatic group. In 82 per cent of his cases of chronic rheumatic heart disease he found the P wave in lead II to be 0.08 second or wider. We found it to be this wide in only 42 per cent of the cases in a similar survey (75 cases), which is only half as great an incidence but nevertheless shows a significant widening.

Direction: An inverted $P_3$ was found in 3 cases and a diphasic $P_3$ of the $\pm$ type was found in 6 cases and of the $\mp$ type in 2 cases. In 1 case a diphasic $P_2$ was observed in conjunction with an inverted $P_3$.

Height: The heights of both $P_1$ and $P_2$ averaged slightly higher than the mean for the normal group (0.705 and 1.313 mm., respectively), being 0.844 mm. and 1.483 mm. There were four P waves in lead I which measured 1.5 mm. or over and six P waves in lead II which measured 2.5 mm. or over.

The average heights of $P_1$ and $P_2$, together with the range, in the electrocardiograms of each group were as follows:

| | $P_1$, Mm. | | $P_2$, Mm. | |
|---|---|---|---|---|
| | Mean | Range | Mean | Range |
| Acute rheumatic carditis | 0.776 | 0.2–1.2 | 1.448 | 0.2–2.5 |
| Rheumatic mitral stenosis and insufficiency | 0.848 | 0.5–1.8 | 1.524 | 0.2–4.0 |
| Rheumatic aortic regurgitation | 1.060 | 0.7–1.5 | 1.570 | 1.0–2.1 |
| Rheumatic mitral stenosis, insufficiency and aortic regurgitation | 0.800 | 0.2–1.2 | 1.347 | 0.5–2.0 |

In computing these averages the cases were included in which $P_3$ was diphasic, iso-electric or inverted.

Weiss found the average height of the P wave in the three leads to be 1.6 mm., 2.0 mm. and 1.0 mm., respectively. Since the sum of $P_1$ and $P_3$ does not even approximately equal $P_2$, there is possibly an error in arithmetic, measurement or standardization.

Notching: Of the 100 hearts, 28 showed notching of the P wave, and 15 of these showed definite or extreme notching. In the electrocardiograms of the normal group there was no definite notching of the P wave and a slight notching in only 9 cases.

Weiss found a notched P wave in 42 of his 87 cases of chronic rheumatic heart disease, and Hecht [16] in 4 of 22 cases.

*The PR (PQ) Interval.*—The mean for the PR interval in the electrocardiograms of the rheumatic group was 0.158 second (the range being from 0.11 to 0.26 second), as compared with the normal mean of 0.132 second. In 29 per cent of the cases the PR exceeded 0.16 second, whereas in the electrocardiograms of the normal group it exceeded 0.16 second in only 1 instance and then by only 0.005 second.

The averages for the different groups were as follows:

| | Mean, Second | Range, Second |
|---|---|---|
| Acute rheumatic carditis | 0.167 | 0.13–0.260 |
| Rheumatic mitral stenosis and insufficiency | 0.149 | 0.11–0.215 |
| Rheumatic aortic regurgitation | 0.171 | 0.14–0.220 |
| Rheumatic mitral stenosis, insufficiency and aortic regurgitation | 0.161 | 0.13–0.230 |

Weiss found the average PR in lead II for his series to be 0.16 second, which closely approximates our figure. However, he found that in 30 per cent of his cases the PR interval was in excess of 0.19 second, whereas in only 8 per cent of ours did it exceed this figure. Hecht found that in 13 of 22 cases it exceeded 0.14 second and that in 4 cases it exceeded 0.19 second, the longest PR being 0.24 second.

We have no case in which partial heart block to the degree of dropped beats was found. However, if we had been able to observe the patients more closely and had recorded numerous electrocardiograms after brief intervals, we might, in some instances at least, have found partial heart block.

*The QRS Complex.*—The QRS interval in the electrocardiograms of the rheumatic group ranged from 0.045 to 0.105 second, with a mean of 0.071 second. This average is somewhat higher than that for the normal children, and the difference is more apparent when one considers that in the rheumatic group there were 12 cases in which the QRS measured 0.09 second or over while in the normal group

there were only 2 cases in which it reached 0.09 second and none in which it exceeded this figure.

A comparison of the QRS intervals for the different groups is as follows:

| | Mean, Second | Range, Second |
|---|---|---|
| Acute rheumatic carditis | 0.070 | 0.050–0.095 |
| Rheumatic mitral stenosis and insufficiency | 0.070 | 0.045–0.095 |
| Rheumatic aortic regurgitation | 0.083 | 0.060–0.105 |
| Rheumatic mitral stenosis, insufficiency and aortic regurgitation | 0.068 | 0.055–0.090 |

Weiss did not give an average for the QRS group, but stated that it closely approximates that for normal children. However, he did find that this interval occasionally reached 0.10 second.

Slurring or notching of the individual waves of the QRS group occurred in 52 per cent of our cases of rheumatic carditis. Clearly abnormal slurring was found in 4 cases and slight slurring in 38 more. In 1 of the cases previously mentioned, the abnormal slurring was seen in the Q wave in lead III. Altogether, notching of the R wave occurred in 10 cases, the incidence in leads I and III corresponding almost exactly to the incidence found in the electrocardiograms of the normal group. In addition, however, notching of the R wave in lead II was observed in 4 cases, in 2 of which the R wave was low and in 2 of which it was high. This conspicuous notching was usually accompanied by widening of the QRS. On the whole, we are inclined to disagree with Weiss, who found no disturbance in intraventricular conduction, and to agree with Coombs,[19] who stated that the abnormalities of the QRS found in the electrocardiograms of children with rheumatic heart disease are relatively mild.

One case of low voltage QRS in a white boy aged 12 was found. This patient had rheumatic mitral stenosis and insufficiency, and the electrocardiogram also showed wide, notched P waves.

19. Coombs, Carey F.: Rheumatic Heart Disease, New York, William Wood & Company, 1924.

*The Electrical Axis.*—The electrical axes for the different groups in the rheumatic series averaged as follows:

| | Mean, Degrees | Range, Degrees |
|---|---|---|
| Acute rheumatic carditis | 61.48 | 30 to 115 |
| Rheumatic mitral stenosis and insufficiency | 70.48 | 20 to 115 |
| Rheumatic aortic regurgitation | 35.33 | —10 to 67 |
| Rheumatic mitral stenosis, insufficiency and aortic regurgitation | 69.69 | 17 to 110 |

Considering normal axis deviation to range from 30 to 90 degrees, we found that in 16 per cent of the cases the deviation was 90 degrees or above (right axis deviation) while in 10 per cent it was 30 degrees or below (left axis deviation).

Weiss found that approximately 60 per cent of his patients with mitral stenosis showed a right axis deviation.

*The RS-T Segment.*—The incidence of shifts of the RS-T segment was found to be the same for the group with acute rheumatic carditis as for the group with chronic valvular disease. However, if we had been able to record serial electrocardiograms during the course of the rheumatic fever, more shifts might have been found for this group. Weiss explained the shifts present in 7 of his 87 cases of chronic rheumatic disease as the expression of latent carditis.

On examining the extent of the shifts for the whole rheumatic group, we found the incidence of a slight shift (under 1 mm.) to be only slightly greater than it was for the normal group, the figures for the two groups being 11 and 9 per cent, respectively. However, in addition, a definite shift (1 mm. or over) was present in 5 cases. The greatest shift for the entire series was found in a case of rheumatic carditis and was present in all three leads, measuring 1 mm. in lead, I, 1.5 mm. in lead II and 2 mm. in lead III. The patient died two days after the electrocardiogram was taken.

Cohn and Swift [4] reported two shifts recorded in the electrocardiograms of patients with acute rheumatic fever which were regarded as similar to those observed in cases of coronary occlusion.

*The T Wave.*—In averaging the heights of the T waves we found that $T_1$ was slightly lower than it was for the normal children and that $T_3$ was slightly higher.

| | $T_1$, Mm. | $T_2$, Mm. | $T_3$, Mm. |
|---|---|---|---|
| Normal children | 2.18 | 2.41 | 0.16 |
| Rheumatic children | 1.90 | 2.35 | 0.61 |

In 17 instances $T_1$ was less than $T_3$, while it was less in only 1 case of a normal child.

The boys' T waves again averaged higher than the girls':

| | $T_1$, Mm. | $T_2$, Mm. | $T_3$, Mm. |
|---|---|---|---|
| Boys | 2.14 | 2.50 | 0.63 |
| Girls | 1.65 | 2.19 | 0.59 |

In 10 cases we found what we could consider to be abnormal T waves. These abnormalities consisted of low T waves in all leads (below 1 mm.), diphasic T waves in lead I, and low, rounded, notched and inverted T waves in lead II.

*The QT Interval.*—Using Ashman and Hull's [20] criteria for the normal upper limit of the QT interval at various rates, we found 7 cases in the rheumatic group in which the QT intervals reached this limit and 25 in which they exceeded it. In the electrocardiograms of our 100 normal control children we found only two QT intervals at the upper limit and four above.

As mentioned in the review of the literature, Berlinger [15] found rheumatic heart disease second among the conditions causing prolongation of the QT interval.

*Arrhythmia.*—A single auricular premature beat was recorded in the electrocardiogram of a Negro girl aged 10 with a rate of 85, who in addition showed slight notching of $P_1$ and $P_2$. No ventricular premature beats were recorded, and there was no case of partial heart block to the degree of dropped beats.

According to our standards, no normal children had definitely abnormal electrocardiograms, and about 5 had minor abnormalities in the electrocardiogram, which might be suggestive of disease. In contrast, in the rheumatic group 40 per cent had definitely abnormal electrocardiograms and 17 per cent more had electrocardiograms suggestive of disease.

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20. Ashman, R., and Hull, E.: Essentials of Electrocardiography, New York, The Macmillan Company, 1937.

THE GROUP WITH CONGENITAL DEFECT

*Age and Sex.*—The group with congenital heart defect consisted of 17 white boys, 22 white girls, 4 Negro boys and 7 Negro girls. The division of the sexes was not equal, there being 21 boys and 29 girls.

On the whole the children in this group were much younger than either the rheumatic or the normal children, the average for the 50 children being 6.67 years. The average ages for the three divisions of the group were:

| | Mean, Years | Frequency |
|---|---|---|
| Pulmonary stenosis and tetralogy of Fallot | 6.5 | 25 |
| Interventricular septal defect | 5.8 | 15 |
| Patent ductus arteriosus | 8.9 | 10 |

*The Heart Rate.*—Probably because of the lower age level, the average rate for this group was higher than that for the normal and for the rheumatic group, the mean being 101.7 beats per minute.

The averages for the three divisions of the group were as follows:

| | Mean, Beats per Minute |
|---|---|
| Pulmonary stenosis and tetralogy of Fallot | 104.2 |
| Interventricular septal defect | 100.9 |
| Patent ductus arteriosus | 86.4 |

*The P Wave.*—The average width of the P wave for this series was 0.072 second, the averages for the three groups being:

| | Mean, Second | Range, Second |
|---|---|---|
| Pulmonary stenosis and tetralogy of Fallot | 0.076 | 0.05 to 0.10 |
| Interventricular septal defect | 0.072 | 0.06 to 0.11 |
| Patent ductus arteriosus | 0.062 | 0.05 to 0.07 |

The group with pulmonary stenosis showed a widening of the P wave equal to that found for the group with rheumatic disease. The group with patent ductus arteriosus showed a P width exactly the same as that for the normal group, while the P width for the children with interventricular septal defect fell between the two.

The heights of $P_1$ and $P_2$ averaged 0.999 and 1.61 mm., respectively, averages which were considerably higher than the normal figures (from 0.705 to 1.313 mm.). The averages for the three groups were:

| | $P_1$, Mm. | | $P_2$, Mm. | |
|---|---|---|---|---|
| | Mean | Range | Mean | Range |
| Pulmonary stenosis and tetralogy of Fallot | 1.147 | 0.2–3.3 | 1.90 | 0.8–3.6 |
| Interventricular septal defect | 0.900 | 0.5–1.5 | 1.46 | 0.5–2.4 |
| Patent ductus arteriosus | 0.780 | 0.2–1.1 | 1.10 | 1.0–1.2 |

In both leads the group with pulmonary stenosis showed the highest P waves.

In the electrocardiograms of 100 per cent of the patients with pulmonary stenosis whom they examined, White and Burwell [5] found either a $P_1$ greater than 1 mm. or a $P_2$ greater than 2 mm. We found a similar situation in 80 per cent of our cases of pulmonary stenosis. In 24 per cent, $P_1$ was 1.5 mm. or more or $P_2$ was 2.5 mm. or above.

The direction of $P_1$ was always upright for the whole series with congenital heart defect. In the electrocardiograms of the group with pulmonary stenosis one deeply inverted (—2.3 mm.) and two diphasic P waves occurred in lead III. We found $P_3$ slightly inverted in 1 case of interventricular septal defect and diphasic in 3 cases. Two diphasic P waves in lead III occurred in the electrocardiograms of the group with patent ductus arteriosus.

Slight or questionable notching occurred in 6 cases, or 12 per cent, of this series, as compared with 9 per cent for the normal group. No definite or conspicious notching of the P wave was observed in any lead, a fact which is in contrast to our findings for the rheumatic group.

*The PR Interval.*—The arithmetical mean of the PR interval was 0.135 second, as compared with the normal average of 0.132 second. The range of this interval corresponded closely to that for the normal children except in 1 case, in which it measured 0.23 second.

*The QRS Complex.*—The average duration of the QRS interval for this series was 0.072, as compared with the normal average of 0.0653, the means for the different groups being:

| | Mean, Second | Range, Second |
|---|---|---|
| Pulmonary stenosis and tetralogy of Fallot | 0.076 | 0.05–0.10 |
| Interventricular septal defect | 0.069 | 0.06–0.085 |
| Patent ductus arteriosus | 0.068 | 0.055–0.085 |

The significant increase in the width of the QRS over the normal for the whole series is due to the influence of the group with pulmonary stenosis and is correlated with the extreme predominance of the right ventricle (electrical axis, 133.7 degrees) found in this group.

Notching and slurring of the QRS complex occurred frequently in the electrocardiograms of children with pulmonary stenosis, being totally absent in only 6 of 25 cases. The QRS in lead II was splintered in 3 cases, and notching of high R waves was present in 6 additional cases. In the remaining 10 cases, there was definite slurring of the R and the S waves.

Notching of the waves of the QRS was found in 20 per cent of the cases in the group with interventricular septal defect, and definite slurring was present in an additional 20 per cent.

Only 1 of the 10 children with patent ductus arteriosus showed a definite slur, which occurred on the upstroke of the R wave in lead I.

*The Electrical Axis.*—Except in 2 cases in which the condition was ambiguous and in which there were deep S waves in all three leads, the electrical axis in the cases of pulmonary stenosis ranged from 99 to 179 degrees, the arithmetical mean being 133.7 degrees. This was to be expected in view of the nature of the defect (White and Burwell,[5] Hecht,[16] Shapiro[8] and Seham[9]).

The axis in the cases of interventricular septal defect ranged from —1 to 90 degrees, the mean being 49.46 degrees. Considering from 30 to 90 degrees as the normal deviation, we found 5 cases (33 per cent) of a left axis deviation, 2 of these being slight, 2 moderate and 1 definite; whereas only 7 per cent of the normal children showed left axis deviation. The electrocardiogram in 1 case showed a slight right axis deviation, while the incidence for the normal children was 6 per cent.

The average electrical axis of the children with patent ductus arteriosus was 59.8 degrees, which closely approximates that for the normal children. The range for the group was from 30 to 76 degrees.

*The RS-T Segment.*—A slight shift (about 0.5 mm.) of the RS-T segment was noticed in 9 of the 25 cases of pulmonary stenosis, a considerable increase in frequency over that for the normal group. The 2 children who showed abnormal shifts of this segment could not be used for comparison with the normal children because 1 definitely and probably both had received digitalis previous to the recording of the electrocardiogram.

In regard to the other two groups with congenital heart disease, a slight shift of the RS-T segment was found in one third of the cases of the interventricular septal defect group and in no case of patent ductus arteriosus.

*The T Wave.*—Since digitalis has an effect on the T waves, the electrocardiograms of the 2 children who had previously had digitalis (both in the group with pulmonary stenosis) were omitted from the calculations. The average heights of the T waves for this series were considerably higher than those for either the normal or the rheumatic children.

The averages for the three divisions and for the entire group were as follows:

| | $T_1$, Mm. | $T_2$, Mm. | $T_3$, Mm. |
|---|---|---|---|
| Pulmonary stenosis and tetralogy of Fallot | 2.36 | 3.16 | 0.90 |
| Interventricular septal defect | 2.61 | 3.68 | 1.13 |
| Patent ductus arteriosus | 2.68 | 2.64 | 0.09 |
| | 2.51 | 3.21 | 0.80 |

Lincoln and Nicolson [10] found that with normal children the average height of the T waves was higher for boys than for girls. We found this to be true, and we also found this difference according to sex in the electrocardiograms of children with rheumatic or congenital heart disease, as is shown in the following tabulation:

| Condition | Sex | $T_1$, Mm. | $T_2$, Mm. | $T_3$, Mm. |
|---|---|---|---|---|
| Normal | M | 2.29 | 2.59 | 0.30 |
| | F | 2.09 | 2.18 | 0.02 |
| Rheumatic | M | 2.14 | 2.50 | 0.63 |
| | F | 1.65 | 2.19 | 0.59 |
| Congenital | M | 2.71 | 3.76 | 1.22 |
| | F | 2.35 | 2.79 | 0.42 |

$T_2$ was slightly inverted in 1 case (—0.8 mm.), diphasic in 2 cases and definitely inverted in 6 cases, the inversions being deep (—3.5, —1.5 and —2.1 mm.) in 3 of these.

In the cases of interventricular septal defect there were no abnormal T waves in lead II. $T_3$ was diphasic in 2 instances and inverted in 3, one inversion reaching —1.5 mm.

$T_2$ was normal in every case of patent ductus arteriosus. In 2 cases $T_3$ was diphasic, and in 4 cases it was inverted, one inversion reaching —2.0 mm.

There were no notched or rounded T waves in the electrocardiograms of the entire group.

From the foregoing comments one can conclude that there were 4 cases in the congenital group in which abnormal T waves were found, 3 of these occurring in the group with pulmonary stenosis. The abnormalities consisted of one inverted $T_2$ and three deeply inverted T waves in lead III.

*The QT Interval.*—We found this interval to be prolonged in 4 cases (16 per cent) of pulmonary stenosis (3 in girls and 1 in a boy). In 3 other cases it reached the upper limit.

In only 1 case (4 per cent) of interventricular septal defect or patent ductus arteriosus was the QT prolonged. In 2 cases it reached the upper limit of normal.

The incidence of long QT intervals in the cases of congenital heart defect, especially of pulmonary stenosis, was greater than that for the normal children but not nearly so great as that for the rheumatic children.

*Arrhythmia.*—There was not a single instance of premature beats in the electrocardiograms of the children with congenital heart defect.

All the children with pulmonary stenosis and tetralogy of Fallot had abnormal electrocardiograms.

The electrocardiogram of 1 child with interventricular septal defect was definitely abnormal, and those of 2 others were suggestive of myocardial disease.

The electrocardiogram of 1 child with patent ductus arteriosus was suggestive of disease.

## SUMMARY AND CONCLUSIONS

The electrocardiograms of 100 children with rheumatic heart disease and of 50 children with congenital heart defect were carefully measured (the heights of the individual deflections and the various intervals of the cardiac cycle), and the averages for the different intervals were compared with those found in the electrocardiograms of the normal group (Part I).

*The Rheumatic Group.*—The principal abnormalities of the P wave in the electrocardiograms of children with rheumatic heart disease are definite and conspicious notching, widening and slight increase in height.

The PR interval is definitely prolonged in a large percentage of cases of rheumatic heart disease.

The abnormalities of the QRS complex are relatively slight, consisting of a small increase in duration and occasional notching or slurring of the individual waves.

Only a slight tendency to right axis deviation was shown in the electrocardiograms of children with mitral stenosis and insufficiency. This was probably due to the fact that in most of our cases the condition was not far advanced. The children with aortic regurgitation showed a definite tendency to left axis deviation.

The incidence of shifts of the RS-T segment is increased, but not so markedly as had been reported elsewhere. However, we were unable to follow our patients closely and to make additional electrocardiograms during the course of the rheumatic fever.

Abnormalities of the T waves were found in 10 per cent of the cases. These abnormalities consisted of low T waves in all leads (below 1 mm.), diphasic T waves in lead I, and low, rounded, notched and inverted T waves in lead II.

The QT interval is often definitely prolonged in cases of rheumatic heart disease.

As with the normal children, the incidence of premature beats is low.

Not all children with rheumatic heart disease have abnormal electrocardiograms.

Even though the electrocardiogram of a child is not definitely abnormal, the presence of any one of the aforementioned abnormalities should suggest the possibility of rheumatic heart disease.

*The Group with Congenital Defect.*—The outstanding abnormalities of the P wave were an increase in the width and in the height, and these were found chiefly in the electrocardiograms of children with pulmonary stenosis and tetralogy of Fallot and to a lesser degree in those of children with interventricular septal defect. The notching of the P wave was not beyond normal limits.

The PR interval was approximately the same as it was in the electrocardiograms of the normal group, but it may be considered to have been slightly prolonged on the average, since the children's mean age was a few years younger in the group with congenital heart defect than in the normal group.

The average duration of the QRS in the electrocardiograms of children with congenital heart defect was longer than that in the electrocardiograms of normal children, even though the children were younger. This increase in duration was due mainly to the influence of the children with pulmonary stenosis.

Notching and slurring of the QRS occurred frequently in the electrocardiograms of children with pulmonary stenosis, occasionally in those of children with interventricular septal defect and rarely in those of children with patent ductus arteriosus.

All the electrocardiograms of children with pulmonary stenosis showed extreme, conspicuous or definite right axis deviation, ranging from 99 to 179 degrees, and in 1 case, not included when the average was computed, the deviation was —125 degrees.

The T waves averaged considerably higher than those in the electrocardiograms of the normal group. As with the normal children, the boys' T waves averaged higher than the girls'.

Abnormalities of the T waves are occasionally found, consisting of inversions of $T_2$ and deep inversions of $T_3$.

The QT interval was slightly prolonged in a few instances.

# A STUDY OF LEAD IV IN NORMAL CHILDREN AND IN AMBULATORY CHILDREN WITH CARDIAC DISEASE

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It has been amply demonstrated that in adults with coronary artery disease the additional use of lead IV of the electrocardiogram may reveal evidence of myocardial damage not disclosed by the three standard leads.[1] In view of this finding it was deemed desirable to determine the value of lead IV in children with various types of heart disease, particularly as a means of detecting the presence of an active rheumatic infection of the heart.

To determine the normal variations of this lead in the electrocardiograms of children, we took tracings for twenty children without cardiac disease who were in the hospital for the treatment of various orthopedic conditions. We then took four lead tracings for seventy-eight children who were attending the cardiac clinic. Their ages ranged from 6 to 15 years. Fifty-seven children had organic heart disease, classified etiologically as rheumatic in forty-nine patients and as congenital in eight. In the remaining twenty-one, the physical signs were not sufficient to justify a diagnosis of organic heart disease (class E).

One hundred and forty-one tracings were studied. Eighty-four of these were obtained from the group of children with rheumatic heart disease: thirty-five during the acute phase and forty-nine during the inactive stage. In addition, two or three successive records were made for twenty-seven children in the rheumatic group. The data obtained from all the tracings have been analyzed with a view to determining the value of lead IV in cases of heart disease of children.

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From the Cardiac Clinic of the Hospital for Joint Diseases.

1. Wood, F. C., and Wolferth, C. C.: Experimental Coronary Occlusions, Arch. Int. Med. **51**:771 (May) 1933. Goldbloom, A. A.: Clinical Evaluation of Lead IV, Am. J. M. Sc. **187**:489 (April) 1934. Hoffman, A. M., and De Long, E.: Standardization of Chest Leads and Their Value in Coronary Thrombosis and Myocardial Damage, Arch. Int. Med. **51**:947 (June) 1933.

## TECHNIC

Two sites were selected: one anteriorly, in the fourth intercostal space just to the left of the sternum, and the second posteriorly, in an area directly opposite. The skin over these places was rubbed briskly with gauze soaked in saline solution. Two small flat German silver disks were applied to these sites and were held

TABLE 1.—*Range of Variations of the Components of Lead IV in Tracings of Normal Children and of Ambulatory Children with Cardiac Disease*

| | | Type of Patient | | | |
|---|---|---|---|---|---|
| | Normal Children | Class E | Congenital Heart Disease | Inactive Rheumatic Heart Disease | Active Rheumatic Heart Disease |
| Number of children | 20 | 21 | 8 | 33 | 18 |
| Number of tracings | 20 | 26 | 11 | 49 | 35 |
| Direction of P wave, percentage | | | | | |
| Positive | 45 | 46 | 18 | 53 | 51 |
| Negative | 40 | 38 | 45 | 30 | 34 |
| Diphasic | 5 | 4 | 9 | 17 | 15 |
| Isoelectric | 10 | 12 | 28 | .. | .. |
| Amplitude of P wave | | | | | |
| Average | 1.5 | 1.9 | 1.9 | 2.1 | 2.1 |
| Range | 1-2 | 1-2.5 | 1.5-2 | 1-4 | 1-3.5 |
| Duration of P wave | | | | | |
| Average | 0.055 | 0.059 | 0.056 | 0.060 | 0.067 |
| Range | 0.04-0.08 | 0.04-0.08 | 0.04-0.08 | 0.04-0.10 | 0.04-0.12 |
| Notched P wave, percentage | 0 | 11 | 0 | 15 | 15 |
| PR interval | | | | | |
| Average | 0.12 | 0.13 | 0.13 | 0.13 | 0.14 |
| Range | 0.10-0.16 | 0.10-0.16 | 0.12-0.16 | 0.10-0.16 | 0.10-0.20 |
| QRS time | | | | | |
| Average | 0.07 | 0.07 | 0.07 | 0.07 | 0.07 |
| Range | 0.05-0.08 | 0.05-0.08 | 0.06-0.08 | 0.05-0.10 | 0.06-0.08 |
| Amplitude of QRS | | | | | |
| Average | 17 | 17 | 15 | 15 | 15 |
| Range | 5-38 | 9-27 | 6-22 | 5-26 | 7-33 |
| Notched, slurred QRS, percentage | 30 | 10 | 55 | 10 | 10 |
| Amplitude of Q wave | | | | | |
| Average | 7 | 7 | 8 | 6 | 6 |
| Range | 3-18 | 4-12 | 1-16 | 1-12 | 2-18 |
| S wave present, percentage | 5 | 8 | 0 | 11 | 6 |
| Amplitude of S wave | | | | | |
| Average | 5 | 2.5 | ... | 2.3 | 3.0 |
| Range | | 2-3 | ... | 1-3 | 2-5 |
| Direction of RT, percentage | | | | | |
| Positive | 10 | 4 | .. | .. | .. |
| Negative | 10 | 24 | 19 | 20 | 13 |
| Iso-electric | 70 | 72 | 72 | 80 | 87 |
| Absent | 10 | .. | 9 | .. | .. |
| Amplitude of T wave | | | | | |
| Average | 3 | 3 | 4 | 3 | 2.8 |
| Range | 1.5-4 | 1.5-5 | 2-4 | 1-5 | 2-3 |
| Direction of T wave, percentage | | | | | |
| Positive | 70 | 40 | 28 | 51 | 39 |
| Negative | 15 | 46 | 42 | 37 | 32 |
| Diphasic | 5 | 4 | .. | 8 | 10 |
| Iso-electric | 10 | 10 | 30 | 4 | 19 |
| Duration of T wave | | | | | |
| Average | 0.14 | 0.13 | 0.15 | 0.13 | 0.14 |
| Range | 0.08-0.16 | 0.10-0.16 | 0.12-0.16 | 0.08-0.20 | 0.12-0.20 |

firmly in place by a metal connecting band which encircled half of the chest. The anterior electrode was connected to the right arm terminal and the posterior electrode to the left arm terminal of the galvanometer. The tracings were taken on lead I of the machine.

## RESULTS

*Single Tracings.*—The detailed analyses of the tracings studied are shown in table 1. It will be seen that our values for the various com-

ponents of lead IV in the records of normal children are, in the main, similar to those described by previous authors.[2] Furthermore, it is seen that, except for the direction of the T wave, these values are substantially the same as those described for lead IV in the tracings of normal adults.[3] The negative $T_4$ wave in the electrocardiograms of adults is in contrast to the frequently occurring positive $T_4$ wave in the tracings of children (it was positive in 70 per cent of the present series). It is evident, therefore, that a positive $T_4$ wave, which is indicative of abnormality in adults, cannot have that significance in children.

While changes in the T wave are not significant, an increase in the conduction time, a deviation of the RT segment and a change in the QRS complex are of importance. However, in the series here reported, when any of these deviations from the normal were seen in lead IV they were also present in the three standard leads. The results presented suggest, therefore, that there is no advantage in taking single lead IV tracings for ambulatory children with cardiac disease.

*Serial Tracings.*—For twenty-seven of the eighty-four children with rheumatic heart disease two and for five of the twenty-seven, three tracings were taken at intervals of several weeks or months. These records were studied with a view to determining whether changes in the direction of the $T_4$ wave were of significance as indications of either the reactivation or the subsidence of the rheumatic infection in the heart. As will be seen in table 2, the serial tracings of twenty-one children showed no change in the direction of the $T_4$ wave. In seventeen patients there was no apparent change in the condition: Those having inactive rheumatic heart disease continued in the same state, and those in the active phase of the disease showed no appreciable variation in the severity of the infection. On the other hand, six children showed changes in the direction of the $T_4$ wave in one or another of the serial tracings. Four of these children manifested no change in their clinical condition, while the remaining two showed clinical and laboratory evidence of a subsidence of the previously active rheumatic infection.

Whether the variations in the direction of the T wave in the tracings of the last six children may have indicated a causal relationship between such changes and the clinical condition or whether these variations may be ascribed to the variability that characterizes this lead in

2. (*a*) Master, A. M.; Dack, S., and Jaffe, Harry L.: Chest Leads in Normal Children, Proc. Soc. Exper. Biol. & Med. **32**:1529 (June) 1935. (*b*) Rosenblum, H., and Sampson, J. J.: A Study of Lead IV of the Electrocardiogram in Children, Am. Heart J. **11**:48 (Jan.) 1936. (*c*) Robinow, M.; Katz, L. N., and Bohning, A.: The Appearance of the T-Wave in Normal Children and in Children with Rheumatic Heart Disease, Am. Heart J. **12**:88 (July) 1936.

3. Shipley, R. A., and Hallaran, W. R.: The Four-Lead Electrocardiogram in Two Hundred Normal Men and Women, Am. Heart J. **11**:325 (March) 1936.

children cannot be determined from our data. However, the finding of Robinow and his co-workers [2c] that even in normal children the $T_4$ wave may be seen to vary in direction when serial tracings are taken gives ground to the belief that no causal relationship can be assumed to exist between changes in the direction of the $T_4$ wave and the presence or absence of active rheumatic infection in ambulatory children with heart disease.

TABLE 2.—*Relation of Direction of $T_4$ Wave to Presence of Active Rheumatic Heart Disease*

| | First Tracing | | Second Tracing | | Third Tracing | |
|---|---|---|---|---|---|---|
| Case No. | Direction of T Wave | Active or Inactive | Direction of T Wave | Active or Inactive | Direction of T Wave | Active or Inactive |
| 1 | Negative | Inactive | Negative | Inactive | ..... | ..... |
| 2 | Negative | Inactive | Negative | Inactive | ..... | ..... |
| 3 | Diphasic | Inactive | Diphasic | Inactive | ..... | ..... |
| 4 | Iso-electric | Inactive | Iso-electric | Inactive | ..... | ..... |
| 5 | Iso-electric | Inactive | Iso-electric | Inactive | ..... | ..... |
| 6 | Iso-electric | Inactive | Iso-electric | Inactive | ..... | ..... |
| 7 | Iso-electric | Inactive | Iso-electric | Inactive | ..... | ..... |
| 8 | Positive | Inactive | Positive | Inactive | ..... | ..... |
| 9 | Positive | Inactive | Positive | Inactive | Positive | Inactive |
| 10 | Positive | Inactive | Positive | Inactive | ..... | ..... |
| 11 | Positive | Inactive | Positive | Inactive | ..... | ..... |
| 12 | Positive | Inactive | Positive | Inactive | ..... | ..... |
| 13 | Positive | Inactive | Positive | Inactive | Positive | Inactive |
| 14 | Positive | Active | Positive | Active | Positive | Active |
| 15 | Positive | Active | Positive | Active | Positive | Active |
| 16 | Iso-electric | Active | Iso-electric | Active | ..... | ..... |
| 17 | Iso-electric | Active | Iso-electric | Active | ..... | ..... |
| 18 | Negative | Active | Negative | Inactive | ..... | ..... |
| 19 | Negative | Active | Negative | Inactive | ..... | ..... |
| 20 | Negative | Inactive | Negative | Active | ..... | ..... |
| 21 | Iso-electric | Active | Iso-electric | Active | Iso-electric | Inactive |
| 22 | Negative | Inactive | Iso-electric | Inactive | ..... | ..... |
| 23 | Iso-electric | Active | Negative | Active | ..... | ..... |
| 24 | Positive | Inactive | Negative | Inactive | ..... | ..... |
| 25 | Positive | Inactive | Negative | Inactive | ..... | ..... |
| 26 | Negative | Active | Iso-electric | Inactive | ..... | ..... |
| 27 | Iso-electric | Active | Diphasic | Inactive | ..... | ..... |

The results of the present study are in substantial agreement with those of Robinow and his co-workers; [2c] but we cannot be certain whether they are in agreement or at variance with the observations of Levy and Bruenn,[4] who found lead IV to be of value in the recognition of the presence of an active rheumatic infection of the heart. Levy and Bruenn failed to state the age of their subjects, and while their conclusions might be applicable to ambulatory adults with rheumatic heart disease, they cannot be applied to children in a like state.

4. Levy, R. L., and Bruenn, H. G.: Lead IV of the Electrocardiogram in Rheumatic Fever, Proc. Soc. Exper. Biol. & Med. **32**:559 (Dec.) 1934.

## CONCLUSIONS

Lead IV in the electrocardiograms of children is characterized by a marked variability in the form and in the direction of its several components.

Upright, diphasic and iso-electric, as well as negative, $T_4$ waves are normal findings in the tracings of children.

In the present series of tracings for ambulatory children with heart disease lead IV supplied no information which was not secured from the three standard leads.

This study provides no justification for the routine use of lead IV for ambulatory children with heart disease.

# INACTIVATION OF POLIOMYELITIS VIRUS BY ULTRAVIOLET IRRADIATION

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It has been shown that the ingestion of vitamin D protects Macacus rhesus monkeys when poliomyelitis virus is subsequently introduced by way of the gastro-intestinal tract and that the lack of vitamin D in the routine diet makes these animals more susceptible to the disease when the virus is so administered.[1]

A natural corollary to these experiments would be to determine how such factors as ultraviolet rays and viosterol would affect the virus. The present experiments deal with ultraviolet irradiation.

## METHOD

Six cubic centimeters of a 1 per cent suspension of potent virus was poured into each of two shallow Petri dishes. The cover was left off one and the contents exposed for seventy-five minutes at a distance of 18 inches from a standard quartz lamp bulb. The contents of this dish was called suspension 1. The cover was placed on the other container, and the whole was covered with a cloth and placed under the quartz lamp at the same time as and side by side with the exposed Petri dish. The contents of the second dish was called suspension 2. Within three hours after exposure, 0.1 cc. of each suspension was separately injected intracerebrally into two animals.

## RESULTS

The animal that received suspension 2 had poliomyelitis within seven days, while the animal that received suspension 1 did not have the disease.

On four subsequent occasions the same experiment was repeated with different lots of stock virus (that originally used was Flexner's M. V.). All animals that received suspension 2 had developed poliomyelitis, quadriplegia occurring in every instance. Three of the animals that were given suspension 1 had no symptoms. The remaining animal of this group was furred and seemed clumsy for two days, but no paresis

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1. Toomey, John A.: Ingestion of Vitamins A, B, C and D and Poliomyelitis, Am. J. Dis. Child. **53**:1202 (May) 1937.

or paralysis developed. The animals that escaped the disease had no protection, as evidenced by the fact that they all became ill with poliomyelitis when virus was later injected into the cortex on the side opposite to the one used for the original experiment.

## COMMENT

After my experiments were finished, my attention was directed to the work of Schultz.[2] He stated that "exposure to ultraviolet rays from a cold quartz lamp inactivates" poliomyelitis virus. The results of my experiments confirmed his fundamental observations.

## CONCLUSION

Ultraviolet rays can inactivate the virus of poliomyelitis.

2. Schultz, E. W.: Recent Advances in the Study of Poliomyelitis, J. Pediat. **1**:358, 1932.

# POLIOMYELITIS ANTISERUM OBTAINED FROM HORSES

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Many physicians who have treated patients with poliomyelitis have come to believe that there is scarcely anything to be gained by using serum from either convalescent human beings or experimental animals, once the patient has contracted the disease. It may be that the antigen used to produce experimental antiserums is not strong enough and that a more effective serum could be obtained by fortifying the specific antigen in some way, or it may be that specific antiserums have not been used to the best advantage, i. e., not in large enough quantities. It was decided to administer injections of a "fortified" antigen to animals to determine the efficacy of the serum thus obtained.

EXPERIMENT 1.—The blood serums of three horses, *3732*, *3733* and *3757*, were tested for natural neutralizing antibodies. The dose for the test was an injection of 0.2 cc. given intracerebrally to Macacus rhesus monkeys and it contained 0.1 cc. of 1 per cent of potent poliomyelitis virus and 0.1 cc. of the serum to be tested. Control monkeys were given injections of combinations of the same proportions of virus and saline solution. Horse *3733* had some protective antibodies, since a 1 : 5 dilution combined with virus gave protection, although a 1 : 10 dilution did not. The other horses did not have any neutralizing antibodies.

Immunization of the horses was started on April 10, 1935. Horse *3757*, the positive control, was given injections of virus suspended in saline solution, while horses *3732* and *3733* were given virus in enteric toxin filtrate (paratyphoid-colon bacillus toxin combined).[1] For convenience, the latter was called "fortified antigen." The dates of injections and the dosages were as follows:

| Date | Suspension of Potent Virus | Dose, Cc. | Method |
|---|---|---|---|
| 4/10/35 | 1% | 50 | Intradermal |
| | | 150 | Subcutaneous |
| 4/19/35 | 1% | 50 | Intradermal |
| | | 150 | Subcutaneous |
| 4/24/35 | 2% | 100 | Subcutaneous |
| | | 100 | Intramuscular |
| 5/ 1/35 | 3% | 100 | Subcutaneous |
| | | 100 | Intramuscular |

From the Department of Pediatrics, Western Reserve University School of Medicine, and the Division of Contagious Diseases, City Hospital. This work was done under a grant from Parke, Davis & Co., Detroit.

1. Toomey, John A.: Accelerated Production of Poliomyelitis, Proc. Soc. Exper. Biol. & Med. **31**:1015, 1934.

| Date | Suspension of Potent Virus | Dose, Cc. | Method |
|---|---|---|---|
| 5/ 8/35 | 4% | 100 | Subcutaneous |
| | | 100 | Intramuscular |
| 5/15/35 | 5% | 100 | Subcutaneous |
| | | 100 | Intramuscular |
| 5/22/35 | 5% | 100 | Subcutaneous |
| | | 100 | Intramuscular |
| 5/29/35 | 5% | 100 | Subcutaneous |
| | | 100 | Intramuscular |
| 6/ 5/35 | 6% | 150 | Subcutaneous |
| | | 150 | Intramuscular |
| 6/12/35 | 6% | 150 | Subcutaneous |
| | | 150 | Intramuscular |
| 6/19/35 | 6% | 200 | Subcutaneous |
| | | 200 | Intramuscular |
| 6/26/35 | 6% | 200 | Subcutaneous |
| | | 200 | Intramuscular |

Horse 3733 manifested a local reaction to each injection.

The injections given to horse 3732 were temporarily discontinued, since paresis of the muscles about the fetlock joints and the hoofs of the hindlegs and steppage gait developed and the animal had great difficulty in walking. The condition gradually became worse and involved the muscles of the hindlegs as well as the muscles of the front hoofs. The horse had difficulty in rising and when up stood with the legs spread. The paresis did not extend farther, the horse began to recover and it was nearly normal by September 3. To my knowledge, this is the first horse in which neurologic involvement has been demonstrated after the administration of injections of poliomyelitis virus. On July 3 and 10 horses 3733 and 3757 each received injections of a 6 per cent suspension of potent virus, 200 cc. subcutaneously and 200 cc. intramuscularly. Horse 3733 became severely ill; the front legs, breast and shoulders became badly swollen, and beginning multiple abscesses and purpura hemorrhagica were diagnosed. Dr. M. J. Smead, resident veterinary surgeon at Parkedale, Mich., gave the animal 20 cc. of a 2 per cent solution of formaldehyde intravenously on July 13 and 14. Both shoulders pointed quickly and were incised. Large amounts of tissue sloughed. Healing was rapid. Horse 3757 showed no local reactions. The highest temperatures were in horse 3732, 104.2 F.; in horse 3733, 103.8 F., and in horse 3757, 104.8 F.

Specimens of blood were tested on July 24 and 31 in dilutions of 1:25. Four Macacus rhesus monkeys received injections in this and in all subsequent tests save where noted—one each with the serum from horses 3732, 3733 and 3757, respectively, and one control which received virus only. The serum from horses 3732 and 3733 gave no protection. In fact, the onset of the disease was accelerated, coming two days before it usually did in the control animal. This observation was verified in three other sets of animals tested. Tests of serums were made on August 12 and 28. There was no neutralization of the virus, although acceleration of the onset of the disease did not occur. Three other tests were made at subsequent intervals without discovering evidence of neutralizing antibodies. A test made on September 10, about three months after the last immunizing injections, showed that serum obtained from horses 3732 and 3757 had a neutralizing antibody content of 1:80.

A second course of injections was begun on September 26. This time the virus used was purified in every instance.[2] It was made in 10 per cent suspensions and then diluted with saline solution to the proper strength as needed. The "fortified" antigen this time consisted of the following: 52.5 Gm. of purified cord virus in 200 cc. of saline solution, 100 cc. of endotoxin obtained by grinding enteric organisms in a ball mill for twenty-four hours, 200 cc. of enteric toxin described previously,[1] 10 cc. of dead bacilli and enough saline solution to make up 525 cc. The amount of organisms added was from 8 cc. to 10 cc., the actual amount being determined by an artificial standard of turbidity. Horse 3757 was given the purified virus only. Horses 3732 and 3733 received the "fortified" antigen. The dates and doses were as follows:

| Date | Suspension of Potent Virus | Dose, Cc. | Method |
|---|---|---|---|
| 9/26/35 | 5% | 50 | Subcutaneous |
| | | 150 | Intramuscular |
| 10/ 2/35 | 10% | 50 | Subcutaneous |
| | | 100 | Intramuscular |
| 10/ 9/35 | 10% | 50 | Subcutaneous |
| | | 100 | Intramuscular |
| 10/17/35 | 10% | 50 | Subcutaneous |
| | | 100 | Intramuscular |
| 10/23/35 | 10% | 50 | Subcutaneous |
| | | 100 | Intramuscular |
| 11/ 1/35 | 10% | 150 | Subcutaneous |
| | | 150 | Intramuscular |
| 11/ 7/35 | 10% | 150 | Subcutaneous |
| | | 150 | Intramuscular |
| 11/27/35 | 5% | 50 | Subcutaneous |
| | | 50 | Intramuscular |
| 12/ 4/35 | 5% | 75 | Subcutaneous |
| | | 75 | Intramusculra |
| 12/12/35 | 5% | 150 | Subcutaneous |
| | | 150 | Intramuscular |
| 12/19/35 | 5% | 150 | Subcutaneous |
| | | 150 | Intramuscular |
| 12/28/35 | 5% | 150 | Subcutaneous |
| | | 150 | Intramuscular |

On November 14 horse 3732 had an abscess over the shoulder area, and horse 3733 had multiple abscesses. The abscessed areas were incised and drained.

Serum drawn on Jan. 9, 1936, was tested on January 13 in four animals, as previously described. No specimen in a dilution beyond 1:10 gave any protection. Serum drawn on January 16 was tested on January 27. No specimen diluted more than 1:25 gave any protection. Serum drawn on January 26 was tested on February 4. Serum from horses 3732 and 3757 in dilutions of 1:80 afforded protection. Although the disease developed in the monkey that was tested with serum obtained from horse 3733, the serum seemed to contain some protective antibodies, since the incubation period was prolonged. Serum drawn on February 8 was tested on

2. Schaeffer, M., and Brebner, W. B.: Purification of Poliomyelitic Virus, Arch. Path. **15**:221 (Feb.) 1933. Sabin, Albert B.: Experiments on the Purification and Concentration of the Virus of Poliomyelitis, J. Exper. Med. **56**:307, 1932.

February 13. Serum from horses 3732 and 3757 in dilutions of 1 : 160 gave protection. The serum from horse 3733 did not. Serum drawn on February 20 was tested on March 3. The serum from horse 3732 in a dilution of 1 : 320 gave protection, while the same dilution of serum from horse 3757 merely caused a prolongation of the incubation period. On March 18 the same serum was tested in the greater dilution of 1 : 500. Serum from horse 3732 protected from the disease. Serum from horse 3757 gave some protection, since the incubation period was prolonged, but the disease developed in the monkey on April 20. Serum drawn on March 18 when tested showed that a 1 : 1,000 dilution of serum from horse 3757 failed to protect from the disease. Serum from horse 3732 gave protection.

Horse 3732, which had received the "fortified" antigen gave a hyperimmune serum, which had a neutralizing antibody titer of 1 : 1,000. This was much higher than that found in serum from horse 3757, which had received only the purified virus. However, in horse 3733, even though the animal had received the "fortified" antigen, the serum did not have a high titer. This may have been due to immunologic factors. This animal, the only one of the three horses which had neutralizing antibodies at the beginning of the experiment, when the antigen was first injected, was the one which showed a marked localized reaction. This reaction occurred after each injection and became more intense as the dosages were increased. Since the virus was not absorbed, multiple points of induration formed, finally breaking down and developing into abscesses. Horse 3732 had only one such abscess. Horse 3757, which was given the pure virus, never showed any reaction. The natural immunity of horse 3733 probably prevented a good response, and the injection of a specific factor to which he may have been at some time sensitized caused a localized reaction, which was probably in the nature of a modified Arthus phenomenon. It is possible that the animal's natural immunity would first have to be broken down before appreciable antibodies could be built up against specific antigens. It is still obvious, however, that the "fortified" antigen produced the more potent neutralizing serum.

An important point which should be stressed is the fact that when the serum was withdrawn, soon after the last injection of the specific antigen in the first immunization series, it actually accelerated the production of the disease when tried in neutralizing experiments. One could possibly term this a "negative-positive" specific reaction.

When diphtheria and other antitoxins are made commercially, the serum is withdrawn shortly after the last immunizing injection. It takes a longer time to immunize a horse against poliomyelitis than against diphtheria, and serum withdrawn too soon after immunization may contain an aggressin which would make its clinical use at that time positively dangerous. The whole question as to the value of specific virus antiserum may depend on the time the neutralizing titer is tested. Perhaps this is why specific antirabic serums have never been proved of value.

Horses 3732 and 3757 were bled in April and the serum placed on ice. The three animals were again bled on August 28, and the neutralizing value of each serum in a 1 : 250 dilution was tested, the methods of injection being the same as before. Serum from horse 3733 did not protect against the disease, while serum from horses 3732 and 3757 gave incomplete protection. It was obvious that there

was no increase in antibody content as time went on. In fact, there was a sharp decrease in titer value of the serum of the horse immunized with the "fortified" antigen. This decrease, however, did not bring it below the neutralizing value of the serum withdrawn from the animal which had been given the plain antigen.

EXPERIMENT 2.—Therapeutic experiments on monkeys were performed as follows: The monkeys were given an intracerebral injection of 0.1 cc. of a 1 per cent suspension of virus, and then the serum was injected in the manner indicated in table 1. In all these and in the other experiments for each separate lot of virus and for each experiment there was a separate control. In the tables the designation "poliomyelitis" signifies complete quadriplegia, unless it is specifically stated that the disease was manifested in less severe form.

TABLE 1.—*Intracerebral Injection of Poliomyelitis Virus Given to Macacus Rhesus Monkeys Before Treatment with Serum* *

| Date of Injection of Virus | Protected with Serum from Horse 3732 | Protected with Serum from Horse 3757 | Control | How Protected |
|---|---|---|---|---|
| 3/24/36 | Monkey 839: poliomyelitis 3/31 | Monkey 840: poliomyelitis 4/1 | Monkey 838: poliomyelitis 4/2 | 10 cc. of serum intramuscularly 3/26; 10 cc. of serum intravenously 3/26; 10 cc. of serum intravenously 3/28 |
| 4/30/26 | Monkey 844: no disease | Monkey 845: poliomyelitis 5/4; died 5/15 | Monkey 846: poliomyelitis 5/6; died 5/8 | 5 cc. of serum in 10 cc. of saline solution intravenously 4/30, 4/31 and 5/4; same dose intrathecally 5/1 (tremors and chills occurred in animals 844 and 845 after injections on 5/1 and 5/4) |
| 5/19/36 | Monkey 847: poliomyelitis 5/27 | Monkey 849: hemispasticity 5/21 | Monkey 851: poliomyelitis 5/24 | 5 cc. of serum in 10 cc. of saline solution intravenously 5/19, 5/20 and 5/21; same dose intrathecally 5/22 |
| | Monkey 848: poliomyelitis 5/28 | Monkey 850: poliomyelitis 5/25 | | |
| 5/23/36 | Monkey 852: poliomyelitis 6/3 | Monkey 854: poliomyelitis incomplete 6/9; recovered | Monkey 856: poliomyelitis 6/3 | 5 cc. of serum in 10 cc. of saline solution intravenously 5/23, 5/24, 5/25 and 5/27 |
| | Monkey 853: poliomyelitis 6/2 | Monkey 855: poliomyelitis 6/7 | | |

* Dose = 0.1 cc. of a 1 per cent suspension of purified virus.

Of the twelve monkeys which received intracerebral injections of virus and were treated with serum, one did not contract the disease and one had a modified attack. The former monkey was not immune, since quadriplegia developed after the animal had been given a subsequent intracerebral injection of virus. Fourteen animals, including the four controls, had quadriplegia (table 1). Such an experience would seem to support the belief that, once the virus has reached the nervous system, treatment is of no avail. On the other hand, antibodies must be formed naturally after the disease strikes the nervous system of the human being; otherwise, no one would recover. Consequently the belief, as just stated, is not literally correct. To be accurate, the statement should be modified to read that "after the administration of virus to Macacus rhesus monkeys intracerebrally (i. e., by way of a highly unnatural and artificial portal of entry), treatment of these monkeys has thus far proved of no avail."

One point is clear from these experiments. It is that the serum did not seem to accentuate or accelerate the production of the disease or to cause any damage. Monkey 844 did not contract the disease, and there was a delay before evidence of the infection appeared in monkey 854. Such variations, however, occasionally may be expected, and it can only be concluded that the giving of hyperimmune serum from horses 3732 and 3757 to Macacus rhesus monkeys failed to modify the course of the disease to any great extent after the virus had been introduced intracerebrally.

Perhaps a large quantity of serum would accomplish better results.

To each monkey weighing 6 pounds, 20 cc. of serum was given. If this ratio were used to determine the dose for human beings, 400 cc. of serum would be necessary for a subject weighing 120 pounds (54.4 Kg.). This would seem impracticable. Nevertheless, an experiment was tried. Monkeys 893, 894 and 895 each received an injection of 0.1 cc. of a 1 per cent suspension of poliomyelitis virus. On the same day—at 11 : 30 a. m., 3 : 30 p. m. and 7 : 30 p. m.—twice daily for the following four days and daily for the next three days, an injection of 5 cc. of hyperimmune serum from horse 3732 in 10 cc. of saline solution was given to monkey 893. The same dose of serum from horse 3757 was given by injection to monkey 894. Both monkeys had some scrotal edema. There was a great deal of difficulty in finding and making injections into the veins, and sometimes they had to be exposed before the injection could be made. Notwithstanding the enormous doses of serum injected—almost enough, in fact, to make the animals water logged, poliomyelitis developed in all of them. Monkey 895, the control, contracted the disease on the seventh day, monkey 893 on the ninth day and monkey 894 on the thirteenth day. The administration of injections of large doses of specific serum to monkeys after they had been given intracerebral injections of the virus did not modify the course of the disease (save occasionally), but it was clear from the experimental evidence that the giving of the serum even after the virus had reached the central nervous system, did not aggravate the disease condition.

EXPERIMENT 3.—It was proposed to determine what the result would be if the experiment were modified so that the serum would be given before the virus had been injected. The dosage of the virus and the method of injection were the same as in the preceding experiments. Protection, however, was established three or four days previous to the administration of virus. Twelve animals—four sets of three each—received injections. In eleven poliomyelitis developed, one of these having only paraplegia. The animal which did not have the disease at this time was, however, not immune to it, since quadriplegia developed after a subsequent intracerebral injection of virus was given.

The suspensions of virus that produce the disease are usually colloidal suspensions. Great quantities of the colloidal entity (at least 10 cc. of a 10 per cent suspension, equal to 1,000 of standard intracerebral doses of Flexner's M.V. strain) have to be present in the blood stream of the experimental animal before the suspension spills over into the central nervous system and produces the disease. The blood seems able to absorb virus. Is it not possible that the particles of specific serum might be dispersed in such quantities of fluid that a colloidal hydremic plethora would result, the blood vascular system would become oversaturated and a transudatic "spilling over" of the antitoxic elements into the nerve tissue would occur?

Two monkeys, 901 and 902, were given intravenous injections of 5 cc. of serum in 25 cc. of saline solution on Aug. 17, 18, 19 and 20, 1936. Immediately after the last injection, monkeys 901, 902 and 903 were given intracerebral injections of 0.1 cc. of a 1 per cent suspension of virus. Monkey 903 contracted quadriplegia on the seventh day. Monkey 901 did not have the disease, while monkey 902 had a mild attack (table 2). The result of the experiment was clear, proving that the hyperimmune "fortified" antigen serum actually protected an animal, even though the virus was introduced intracerebrally.

Perhaps a lesser amount of serum in a greater diluent of saline solution might protect from the disease. Monkeys 907 and 908 were given intravenous injections of 5 cc. of serum in 40 cc. of saline solution on September 2 and 3. Also on September 3 the two animals, together with monkey 909, the control, received an

TABLE 2.—*Intracerebral Injection of Poliomyelitis Virus Given to Macacus Rhesus Monkeys After Treatment with Serum**

| Date of Injection of Virus | Protected with Serum from Horse 3732 | Protected with Serum from Horse 3757 | Control | How Protected |
|---|---|---|---|---|
| 6/8/36 | ..... | Monkey 861: poliomyelitis 6/16<br>Monkey 862: no disease | Monkey 863: poliomyelitis 6/15 | 5 cc. of serum in 10 cc. of saline solution intravenously 6/6, 6/7 and 6/8; same dose intramuscularly 6/6, 6/7 and 6/8 |
| 6/22/36 | Monkey 868: poliomyelitis 6/29<br>Monkey 869: poliomyelitis 6/29; died 7/2 | ..... | Monkey 870: poliomyelitis 6/29; died 7/1 | 5 cc. of serum in 10 cc. of saline solution intravenously 6/20, 6/21 and 6/22; same dose intramuscularly 6/20, 6/21 and 6/22 |
| 7/2/36 | Monkey 875: poliomyelitis 7/11 | Monkey 876: poliomyelitis 7/12 | Monkey 859: poliomyelitis 7/8 | 5 cc. of serum in 10 cc. of saline solution intramuscularly 6/29 and 7/1; same dose intravenously 6/30 and 7/2 |
| 7/17/36 | Monkey 880: poliomyelitis 7/27 | Monkey 881: poliomyelitis (only both legs involved) 7/27 | Monkey 882: poliomyelitis 7/23 | 5 cc. of serum in 10 cc. of saline solution intravenously 7/14, 7/15, 7/16 and 7/17 |

* Dose = 0.1 cc. of a 1 per cent suspension of purified virus.

intracerebral injection of 0.1 cc. of a 1 per cent suspension of virus. All the animals contracted the disease. The amount of serum injected in this experiment was insufficient to cure.

The experiment was then repeated in modified form. Serum was given in large amounts of saline solution for four days preceding the intracerebral injection. Monkey 924 was given 10 cc. of serum from horse 3732 in 40 cc. of saline solution daily for four days; monkey 925 received the same amount of serum from horse 3757, and monkey 926 was the control. All three were given intracerebral injections of 0.1 cc. of a 1 per cent suspension of virus. As before, when the animals were given injections of enough serum in a large volume of saline solution some degree of protection was established. Monkey 926, the control, had beginning paralysis of the arms on the seventh day and was completely quadriplegic by the ninth day. Monkey 924 had quadriplegia on the eleventh day, and monkey 925 showed a slight weakness of both legs and feet; although the weakness persisted for several days, the animal finally completely recovered from it. The lesser amount of

serum given to the previous group of animals was not enough to protect them from poliomyelitis, but the amount given the latter group did afford some measure of protection. It should be mentioned that in all of these experiments the virus was injected immediately after the last intravenous injection of serum.

Perhaps injections of a certain amount of serum in a large quantity of saline solution may be more effective than repeated injections of the same amount of serum alone, and prior injections of such serum diluted greatly with saline solution can actually stave off poliomyelitis in some instances, even when the virus is injected intracerebrally.

EXPERIMENT 4.—No experiment made thus far showed any marked beneficial effect of treatment with specific serum, except as noted, although it was clear that animals which received injections of serum showed no ill effects even after large doses. The conclusion might be advanced that serum is of no value. This would be erroneous, however, if it is admitted, as it must be, that the method of injection was too artificial for one to expect any other result. In considering immunity and protection from infection, one must think in terms of natural portals of entry. Bacillus coli, although innocuous in the intestines, can cause severe infection elsewhere. If local protection were established at a point of continued exposure, there obviously would be no necessity for protection at points of occasional exposure. Nature has not provided the brain and spinal cord, covered and protected as they are, with any method of defending themselves against the various viruses. On the contrary, the gastro-intestinal tract does protect itself well, and the virus is cushioned and diffused by myelin, which can abort the spread of the virus and hold it in combination until nature has destroyed it.[3]

Animals may be protected from a rabies infection by dermal injections of rabies vaccine, and yet the same protected animals may succumb to rabies if virus is subsequently injected intracerebrally. The same is true of poliomyelitis virus. It is at the natural portal of entry that nature combats disease. I have stated a sufficient number of reasons for believing that the portal of entry for this disease is the gastro-intestinal tract.[4] I have also suggested that the myelin of the sympathetic and parasympathetic nervous systems is the cushion which prevents the spread of the virus from the gastro-intestinal tract. It was entirely logical, then, to determine what effect serum would have on animals into which the virus had been introduced by what I believe to be the natural portal of entry, i. e., the gastro-intestinal tract.

3. Toomey, John A.: Ingestion of Vitamins A, B, C and D and Poliomyelitis, Am. J. Dis. Child. **53**:1202 (May) 1937.

4. Toomey, John A.: The Gastrointestinal Portal of Entry in Poliomyelitis, J. Pediat. **8**:664, 1936.

In the following experiments, the monkeys were prepared in sets of three and were given injections of serum in various ways, as noted in table 3. After three or four days of preparation, the animals received subserosal injections in all instances, save those otherwise noted, of 50 cc. of a 5 per cent suspension of virus. There were five sets of monkeys, three in each set, of which ten were prepared animals and five were control animals. The contrast was striking. There was no evidence of disease in three of the prepared animals; a barely perceptible weakness, which lasted only a few days, was found in six of them, and weakness was evidenced by one, monkey 878, which recovered quickly but later died of sarcosporidiosis. Of the five controls, two died of poliomyelitis, and the other three had obvious paresis, ending in atrophy. The experience was the same

TABLE 3.—*Subserosal Injection of Poliomyelitis Virus Given to Macacus Rhesus Monkeys After Treatment with Serum* *

| Date of Injection of Virus | Protected with Serum from Horse 3732 | Protected with Serum from Horse 3757 | Control | How Protected |
|---|---|---|---|---|
| 6/8/36 | Monkey 859: no disease | Monkey 865: barely perceptible weakness of left foot | Monkey 864: paresis of left leg and both feet | 5 cc. of serum in 10 cc. of saline solution intravenously 6/6, 6/7 and 6/8; same dose intramuscularly 6/6, 6/7 and 6/8 |
| 6/22/36 | Monkey 860: barely perceptible weakness of left leg | Monkey 866: no disease | Monkey 867: poliomyelitis 6/26; died 6/27 | 5 cc. of serum in 10 cc. of saline solution intravenously 6/6, 6/7 and 6/8; same dose intramuscularly 6/6, 6/7 and 6/8 |
| 7/2/36 | Monkey 872: barely perceptible weakness of one leg | Monkey 873: barely perceptible weakness of one foot | Monkey 874: poliomyelitis 7/11; died 7/12 | 5 cc. of serum in 10 cc. of saline solution intramuscularly 6/29 and 7/1; same dose intravenously 6/30 and 7/2 |
| 7/16/36 | Monkey 877: barely perceptible temporary weakness of one foot 7/30 | Monkey 878: both legs weak, especially left 7/30; thin; has some other disease | Monkey 879: both legs weak; definite paresis present 7/30 | 5 cc. of serum in 10 cc. of saline solution intravenously 7/13, 7/14, 7/15 and 7/16 |
| 8/20/36 | Monkey 898: active; slight weakness of left foot | Monkey 899: active; no disease | Monkey 900: both legs floppy, especially right | 5 cc. of serum in 25 cc. of saline solution intravenously 8/17, 8/18, 8/19 and 8/20 |

* Dose = 50 cc. of a 5 per cent suspension of purified virus.

with three other sets, of three animals each, which were prepared and treated in the same way. The therapeutic dose was then lessened for two sets of prepared animals to 5 cc. of serum in 40 cc. of saline solution for two doses, and comparable beneficial results were obtained (table 3). It can thus be seen that animals which are to be given virus by way of the gastro-intestinal tract may be protected beforehand by giving them specific serum.

The dose necessary to produce quadriplegia in the experimental animal when the virus is introduced by way of the gastro-intestinal tract depends on the condition of the animal. A normal, well fed monkey may be given from 3,000 to 5,000 times the intracerebral infecting dose before the disease occurs. It is obvious, therefore, that some modicum of natural protection must be afforded by the gastro-

intestinal tract in the ordinary animal, and from my experiments it is seen that this natural protection is easily increased by the injection of specific serums until the point is reached at which the disease can be aborted.

EXPERIMENT 5.—The experiments previously described were made on animals protected before the dose of virus was given. What would be the result in animals first given the virus subserosally and then treated with serum?

Monkeys 841, 842 and 843 were given 50 cc. of a 5 per cent purified suspension of virus subserosally on April 4, 1936. Monkey 841 was given 10 cc. of serum from horse 3732 intravenously on April 6, 9 and 14. Monkey 842 was given the same dose of serum from horse 3757. The control showed quadriplegia on April 16 and died the next day. Monkey 841 contracted poliomyelitic paralysis of both legs and died May 17 of an infestation with Sarcosporidia. The delay of two days between the time of the injection of the virus and the time when treatment with serum began was evidently too long, especially since it is known that virus injected subserosally causes appreciable changes in the cord within twenty-four hours and greater changes within forty-eight hours after injection.[5]

The three animals in the next set were given an injection of 50 cc. of a 5 per cent suspension of virus subserosally, and treatment with serum was started at once. Monkey 890 received an injection of 5 cc. of serum from horse 3732 combined with 10 cc. of saline solution, injected intravenously, three times on the first day after the injection of the virus, twice on the second, the third, the fourth and the fifth day, and once on the sixth and the seventh days. The same amount of serum from horse 3757 was given to monkey 891. Monkey 890 had some swelling about the ankles due to faulty injection. Except for a slight weakness, the animal was always active. Monkey 891 was inactive for only one day and showed no paralysis. Monkey 892, the control, had definite involvement of both legs and resultant atrophy of the left foot and leg. It was thus obvious that protection could be established by treating these animals with serum, even after the virus had been introduced subserosally.

The amount of serum injected in the last experiment was large. The next experiment was planned to use less serum, diluted with larger quantities of saline solution, for the reasons mentioned previously. Three monkeys, 886A, 887A and 888A, were given an injection of 50 cc. of a 5 per cent suspension of virus subserosally. The same day monkey 886A received 5 cc. of serum from horse 3732 in 25 cc. of saline solution, injected intravenously, and every day thereafter for four days the dose was repeated. Monkey 887A was given the same amount of serum from horse 3757. Monkey 888A was the control. Monkey 886A had some scrotal edema, but both it and monkey 887A were always active. Monkey 888A, the control, became very ill, and both legs were involved, the paralysis being especially conspicuous in the left leg. Thus the beneficial therapeutic effect of protection by injections of serum was again demonstrated.

For the next experiment the dose of virus was increased, and the amount of serum to be administered was decreased. Monkeys 904, 905 and 906 were given 70 cc. of a 5 per cent suspension of virus subserosally. Monkey 904 received an injection of 5 cc. of serum from horse 3732 in 25 cc. of saline solution, given intravenously, daily for four days. Monkey 905 was treated likewise with serum from

5. Toomey, John A., and Weaver, H. M.: Poliomyelitis and Regeneration of Peripheral Nerves, Proc. Soc. Exper. Biol. & Med. **34**:541, 1936.

horse 3757. Both monkey 904 and monkey 905 were always active, though each had edema of the legs and scrotum. Monkey 906, the control, died of the disease on the seventh day.

In the following experiment monkeys 921, 922 and 923 were given subserosal injections of 75 cc of a 5 per cent suspension of virus. Monkey 921 was given only 10 cc. of serum from horse 3732 in 40 cc. of saline solution daily for two days, and monkey 922 received a like amount of serum from horse 3757. Monkey 923 was the control. Monkey 921, except for a barely perceptible weakness of a leg, was always active and well. Weakness of both legs developed in monkey 922, and the animal passed through a period during which it was inactive and furred. Monkey 923, the control, was sick immediately after the operation and became furred, weak and inactive. Bilateral paresis of both legs and feet developed together with weakness of some of the muscles of the arms, and the animal died on the ninth day after the injection of virus of poliomyelitis.

## COMMENT

Others as well as I, using virus as the antigen, have obtained hyperimmune serums from horses, but the "fortified" antigen here described gives a serum of a higher neutralizing value. Neither type of immune serum accelerated the production of paralysis or made the condition of the monkeys worse when they were treated after the virus had been injected; nor did either type seem greatly to modify the course of the disease when the virus was introduced intracerebrally, unless it was given in large amounts of saline solution. However, irrespective of whether the virus was given subserosally before or after treatment with serum, there was protection when the serum was used.

## CONCLUSION

A hyperimmune antipoliomyelitis horse serum can be obtained by the use of a "fortified" antigen as described. Experiments are in progress to determine whether such serums can be consistently produced in the horse.

# FACTORS INFLUENCING THE RESULTS OF TONSILLECTOMY AND ADENOIDECTOMY

## A STUDY OF FIVE HUNDRED AND FORTY CHILDREN, CORRELATING THE PREOPERATIVE COMPLAINTS, THE AGE OF THE CHILD, THE TYPE OF TONSILS AND MICROSCOPIC STUDY OF THE TONSILS WITH THE POSTOPERATIVE RESULTS

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Disappointing results following tonsillectomy and adenoidectomy are common, perhaps unnecessarily so. Diverse results in apparently similar cases are common enough to have led Dean [1] to say before a recent national meeting of otolaryngologists: "Practically, the removal of tonsils is always a gamble." No one disagreed with him. Yet there must be differences between the children who are benefited by tonsillectomy and those who are not. A knowledge of those differences should decrease the number of disappointing results.

It was with the hope of gaining an understanding of at least some of those differences that this study, in which 540 children were seen before and after their operations for a period of two years, was made.

There were two objects in mind. The first object, as already intimated, was to determine, if possible, what points in the history of the case and in the appearance of the throat are significant with reference to the clinical result obtained. The second object was to arrive at a more certain method of prognosis and more specific criteria for both prognosis and indications for tonsillectomy and adenoidectomy.

### MATERIAL AND METHOD

All the children were patients in the clinic of the Children's Memorial Hospital. The original group included 1,200 children. Of these, 540 returned for observation often enough over a period of two years after operation to be used

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From the Otho S. A. Sprague Memorial Institute and the Children's Memorial Hospital, Chicago.

1. Dean, L. W.: The Tonsils, Their Function and Indications for Their Removal, J. A. M. A. **103**:1044 (Oct. 6) 1934.

for this study. This group of 540 children ranged from 2 to 13 years of age at the time of operation. The age distribution was:

| | |
|---|---|
| From 2 to 6 years old | 112 |
| From 6 to 10 years old | 310 |
| From 10 to 13 years old | 118 |

Each child had had tonsillectomy and adenoidectomy recommended by one of the attending pediatricians in the clinic. Each had then been seen by an otolaryngologist, who concurred in the recommendation. These recommendations were based on complete histories and physical examinations. They were as little influenced as was humanly possible by recommendations from school or by parental desires.

On the second day previous to that set for the operation these children came to the clinic for cultures of material from the nose and throat. At that time I saw them and took a detailed history concerning the complaints that might be related to disease of the tonsils and adenoids. Each complaint was catalogued as to frequency and severity during the preceding two years. The severity was judged by whether the child had had to be kept in bed and for how long, by the presence of fever, by the number of days of school missed and by the duration of each attack.

It was recognized that histories are always somewhat unreliable, but it was hoped that through specific questions a reasonably accurate record could be obtained as to the type, frequency and severity of the diseases of the respiratory tract previous to operation.

In the physical examination the following points were noted: height, weight, size of tonsil, type of tonsils, tonsillar pillars, cervical lymph nodes, mouth breathing, prominence of tonsillar crypts, nasal and oral deformities, lymphoid tissue on the pharyngeal wall and postnasal discharge.

The operations were done under ether anesthesia. The tonsillectomies were done with the Beck type of rigid frame tonsillotome in approximately five sixths of the cases and with dissection and snare in the remainder. The operations were performed by the attending otolaryngologists or by graduate interns under their direction.

The tonsils and adenoids of each child were weighed after removal.

In 205 of the 540 cases I made a digital examination of the nasopharynx after the child was anesthetized. This was to determine the actual degree of obstruction to nasal respiration.

In 152 cases histologic sections from each tonsil were studied.

After the operation each child was seen every three or four months the first year and twice the second year. It was thought that with the comparatively frequent visits a more accurate record could be kept and less reliance would have to be placed on the parents' memories.

At each postoperative visit the same questions were asked as those of the preoperative record. All the questions, examinations and recordings were done by myself, to insure uniformity and to facilitate the interpretation of the findings. The entire study covered a period of approximately four years, during each year of which there were several widespread epidemics of moderately severe infection of the upper respiratory tract.

FACTORS INFLUENCING THE RESULTS

*Preoperative Complaint.*—If the children were grouped as to preoperative complaints, the best results were in the group with cervical adenitis. In 92 per cent of these children there was complete freedom from that symptom in the two years following operation, and only 3 per cent were unimproved (chart 1).

The results in the group with the preoperative complaint of pharyngitis were almost equally good.

The next most satisfactory results were in the group with the complaint of mouth breathing; 79 per cent were cured, and 4 per cent were unimproved.

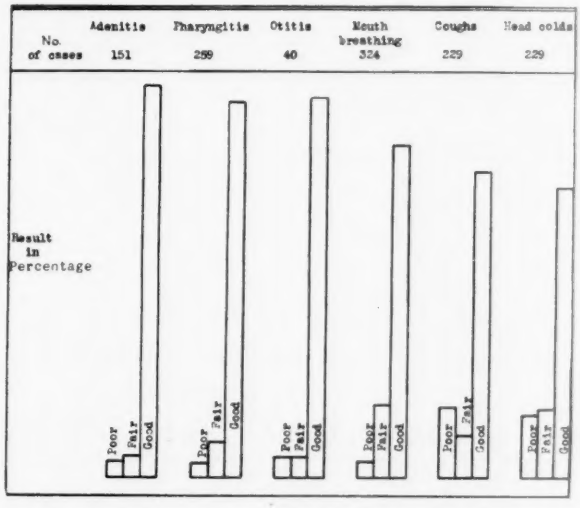


Chart 1.—Improvement and frequency of symptoms.

Of those complaining of cough, 73 per cent were free from cough after operation, 10 per cent were improved (with less severe or less frequent cough) and 17 per cent were unimproved.

The poorest results were in the group with head colds.

The results were good in cases of recurrent suppurative otitis media, as might be expected. Of the 40 children with the condition, 36 were free from it after operation. Of these, 4 had had continuously discharging ears for six months or longer. Two of these 4 remained unimproved.

Most of the children had more than one type of complaint. In about one fourth of the cases one of the symptoms, such as pharyngitis, was completely relieved after operation while another, such as frequent

cough, still persisted, although usually to a lesser degree. The results in the 540 children for all the symptoms were as follows:

| | | |
|---|---|---|
| Complete relief from all symptoms | 324 | (60 per cent) |
| Moderate to marked improvement | 126 | (23.3 per cent) |
| Little or no improvement | 90 | (16.7 per cent) |

The results for all conditions were somewhat better than those reported by Kaiser [2] in his one year and three year postoperative observations on 4,400 children. They are more nearly like those described by Selkirk and Mitchell [3] in their report on 130 carefully observed children. However, they agree with the results of those authors and with the observations of others [4] in that the most improvement was in cases of sore throat, cervical adenitis or mouth breathing and the least in cases of head cold or cough.

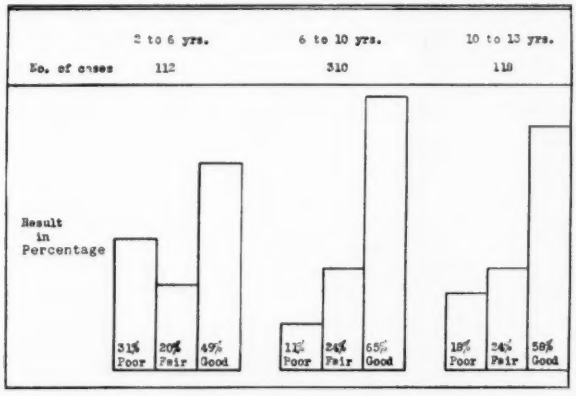


Chart 2.—Results by age.

*Age.*—The children between 6 and 10 years of age made the best showing, with 65 per cent free from all their complaints after operation and only 11 per cent showing little or no improvement. As can be seen in chart 2, the poorest results were in the children under 6 years old. The results in the group from 10 to 13 years old compared favorably with those in the best group.

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2. Kaiser, A. D.: The Relations of Tonsils and Adenoids to Infections in Children, Based on Control Study of Forty-Four Hundred Children Over Ten Year Period, Am. J. Dis. Child. **41**:568 (March) 1931.

3. Selkirk, T. K., and Mitchell, A. G.: Evaluation of the Results of Tonsillectomy and Adenoidectomy, Am. J. Dis. Child. **42**:9 (July) 1931.

4. (*a*) Coakley, C. G., and Pratt, E. L.: Analysis of Systemic and Local Conditions Following Tonsillectomy and Adenoidectomy, Laryngoscope **32**:81 (Feb.) 1922. (*b*) Keen, J. A.: End-Results of Tonsil and Adenoid Operation in Children, Lancet **1**:979 (May 6) 1933.

No reports were found in the literature with which to compare these results. Noble and Hecht [5] stated that failures are frequent in children under 5 years of age. Laurens [6] said that tonsils and adenoids may be removed at any age when removal is indicated and that the child need not be 5 or 6 years old. Dean [1] stated that he preferred not to remove tonsils before the child was 2 years of age. In Kaiser's study no distinction was made as to results by age, since all the children were from 4 to 7 years old. Coakley and Pratt [4a] concluded from their study of 926 children from 1 to 15 years old that operation might properly be recommended for children at any age.

*Age and the Preoperative Complaint.*—When the results by age were analyzed further, it was found that the children under 6 years old did a little better than the other groups when pharyngitis was the main

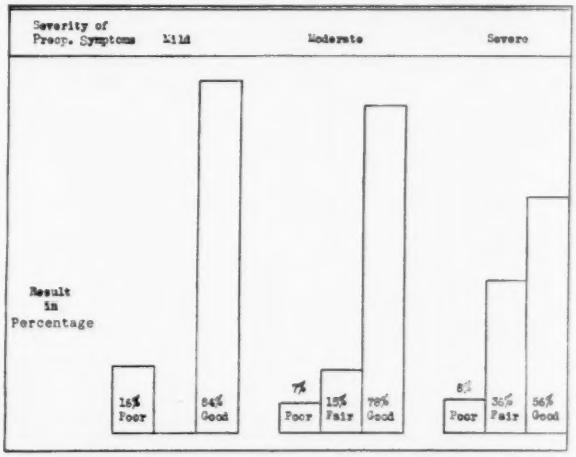


Chart 3.—Results as related to the severity of the preoperative symptoms.

complaint but responded poorly to the operation if it was undertaken for mouth breathing, cough or head colds.

In connection with mouth breathing, 26 per cent of the operations were complete failures in children under 6 years old, as compared with 4 per cent and 8 per cent, respectively, in the two older groups.

Children between the ages of 6 and 10 years showed a good result when the main complaint was cough, whereas both the other age groups showed poor results for the same complaint.

*Severity of the Preoperative Symptom.*—The more severe the preoperative symptom the more likely it was that there would still be some

5. Noble, E., and Hecht, A. F.: The Tonsils, Klin. Wchnschr. **4**:1049 (May 28) 1925; abstr., J. A. M. A. **85**:396 (Aug. 1) 1925.

6. Laurens, Georges: Oto-Rhino-Laryngology, New York, William Wood & Company, 1922.

remnant of that complaint after operation. This was equally true of all the types of complaints and of all the age groups.

Eighty-four per cent of the children with comparatively mild symptoms completely recovered; 78 per cent of those with moderately severe symptoms showed excellent results, and 56 per cent of those with very severe symptoms showed excellent results, although in the last group an additional 36 per cent were improved (chart 3).

When the children were separated according to complaints, the results in each group were similar to those in all the groups together, except that the poor results in the group with severe complaints were accentuated in the group with mouth breathing and least marked in the group with pharyngitis.

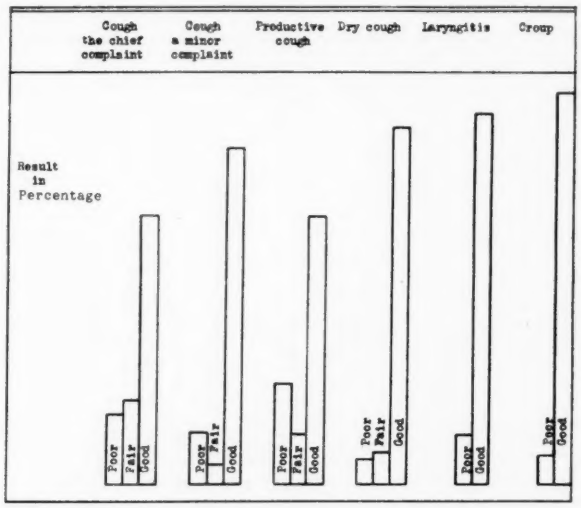


Chart 4.—Results for the symptom of repeated cough.

*Type of Cough.*—Further analysis of the cases of cough gives some interesting information (chart 4). Of the 29 children who had croup in the year preceding tonsillectomy, only 2 continued to have croupy attacks after operation. How far the tonsillectomy was instrumental in this reduction one can only guess, since croup is a disease of early childhood and tends to disappear spontaneously.

Of 60 children who were subject to attacks of laryngitis before operation, 7 continued to have such attacks after operation, but with lessened frequency in most cases.

Of the children whose complaint was cough, those with a dry cough did very well (87 per cent were cured, and 7 per cent were unimproved), whereas of those with a productive cough only 63 per cent had no recurrence after operation and 24 per cent were unimproved.

When cough was a minor complaint, the results were fairly good (80 per cent were cured, and 12 per cent were unimproved), but of the children in whom cough was the chief complaint, only 63 per cent were cured and 17 per cent were unimproved.

*Type of Tonsils and Adenoids.*—There was no apparent relation between the size of the tonsils and the result of the operation. Nor was there any evident connection between the amount of caseous matter in the crypts and the results or between the size of the crypts and the results.

No correlation could be found between the size of the adenoids and the results.

Of the 540 pairs of tonsils, 164 were considered submerged, or buried. For purposes of comparison they were classified as 1 plus, 2 plus and 3 plus buried; there were 72, 55 and 39 in the three classes, respectively. The children with buried tonsils showed no significant differences from the other children. No differences in the type or the severity of the preoperative symptoms, in the speed of recovery from the immediate effects of the operation or in the final results could be related to the fact that the tonsils were buried.

*Tonsillar Infection.*—Criteria of Infection: Three or four sections from each of 152 pairs of tonsils were studied.[7] If small groups of leukocytes were observed in the crypts but with no ulcerations, this was considered evidence of slight infection. If there were any actual parenchymal abscesses, crypt abscesses with destruction of epithelium, cysts or replacement of tonsillar tissues with connective tissue, the infection was considered chronic and from moderate to severe according to the extent of the destructive process.

On that basis none of the 152 pairs of tonsils could be considered entirely normal. The distribution was:

| | Pairs |
|---|---|
| Minimal pathologic changes | 19 |
| Mild chronic infection | 79 |
| Moderately severe chronic infection | 35 |
| Practically complete destruction of the tonsils | 19 |

The criteria of infection were derived from a combination of opinions from various representative sources. Individual opinions vary greatly. Maximow[8] stated that neutrophilic leukocytes are always present in small numbers. He also stated that large numbers mean inflammation, of which he said a mild degree is common.

7. Dr. H. Gideon Wells checked the observations on many of these microscopic sections.

8. Maximow, A. A., and Bloom, W.: Textbook of Histology, Philadelphia, W. B. Saunders Company, 1931.

Kaufmann [9] said that dilated crypts with an increase in the caseous content and some increase in the connective tissue mark the chronically diseased tonsil.

In Jackson and Coates' text,[10] de Veer stated that abscessed crypts are, "beyond the stage of infancy, a practically universal condition."

Crowe [11] expressed the belief that destruction of the epithelium of the crypt is the best single criterion to warrant the histologic diagnosis of infection.

Wilkinson [12] said: "All tonsils show evidence of chronic infection, if the presence of leukocytes in the crypts and ulceration of the epithelium are an indication of infection."

Hambrecht and Nuzum [13] found pathologic changes in 93 per cent of 218 pairs of tonsils, 60 per cent of which were from children. Others have found a less high percentage of infection: Reinhardt,[14] 80 per cent, and Smith,[15] 75 per cent.

Relation of Tonsillar Infection to Symptoms: There were no significant differences in the severity of the preoperative symptoms or in the postoperative results in the several groups when the children were divided according to the degree of tonsillar infection. This lack of connection between the severity of the symptoms and the tonsillar infection was strikingly apparent in individual children from each group. For example, some well nourished children with no complaint save mouth breathing had tonsils riddled with abscesses and sealed off with scar tissue. On the other hand, some of the children complaining of almost constant sore throat accompanied by severe systemic reactions had almost normal tonsils.

There was not even a tendency for the group whose tonsils showed the most pathologic changes to include proportionately more of the children with the preoperative complaint of severe infection of the throat.

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9. Kaufmann, Edward: Pathology for Students and Practitioners, Philadelphia, P. Blakiston's Son & Co., 1929.

10. Jackson, Chevalier, and Coates, G. M.: The Nose, Throat and Ear and Their Diseases, Philadelphia, W. B. Saunders Company, 1929, pp. 250-282.

11. Crowe, S. J., in Lewis, Dean: Practice of Surgery, Hagerstown, Md., W. F. Prior Company, Inc., 1935, vol. 4, chap. 6, p. 1.

12. Wilkinson, H. F.: Pathologic Changes in Tonsils, Arch. Otolaryng. **10:** 127 (Aug.) 1929.

13. Hambrecht, Leonora, and Nuzum, F. R.: A Correlated Study of the Indications for Tonsillectomy and of the Pathology and Bacteriology of the Excised Tonsils, Arch. Int. Med. **29:**635 (May) 1922.

14. Reinhardt, H. L.: Pathology of One Hundred Consecutive Tonsils, Ohio State M. J. **27:**786 (Oct.) 1931.

15. Smith, H. D.: Microscopic Pathology of the Palatine Tonsil, Arch. Otolaryng. **21:**426 (April) 1935.

The weights and heights of the children with badly infected tonsils were as close to average as those of the children with mild or moderate pathologic changes in their tonsils.

The number of cases of growing pains or any of the more severe rheumatic symptoms was too small to warrant an attempt to correlate the degree of tonsillar infection with those complaints.

*Degree of Obstruction by the Adenoids.*—In 205 cases I made a digital examination of the nasopharynx after the child was anesthetized. It was possible to get some interesting data on the relation of obstruction by the adenoids to mouth breathing.

As was to be expected, all the 79 children with almost entirely obstructed pharyngeal spaces complained of some degree of mouth breathing. The surprising thing was the number of children with only slight narrowing of the nasopharyngeal space who presented the symptom of mouth breathing. Of 37 children with practically no obstruction of the nasopharyngeal space, 20 showed some degree of mouth breathing; of these, 11 were almost constant mouth breathers.

Even more surprising was the fact that the children with comparatively little blocking of the respiration by the adenoids were frequently cured of mouth breathing by the removal of the tonsils and adenoids. Of the 11 children who were constant mouth breathers, who on digital examination were found to have little nasopharyngeal narrowing and whose adenoids on removal were found to be small, 6 were completely cured of mouth breathing and 2 others were improved after the operation.

There was no doubt that these children were mouth breathers, the symptoms having been noted on the record of the physical examination as well as in the patient's history. After operation both the histories and the examinations showed the disappearance of that symptom. It seems probable that the irritation of frequent infections kept the nasal passages sufficiently hyperemic to obstruct the free passage of air. With the removal of the tonsils and adenoids there was a decrease in the frequency and the severity of infection of the respiratory passages and also in the swelling of the nasal mucosa, with greater facility in nasal breathing.

Most of the failures to cure mouth breathing were readily explainable by nasal obstruction or by the fact that the architecture of the lower jaw and of the maxilla made it impossible for the child to keep his mouth closed even though nose breathing was otherwise possible.

*Pharyngeal Lymphoid Hypertrophy.*—In general, the presence of hypertrophied pharyngeal lymphoid tissue (other than adenoids) before operation was an indication that the results of the operation would be gratifying. The results in children having such hypertrophy ranged

from 14 per cent to 23 per cent better than the results for the series as a whole for the various complaints and in the different age groups.

There were 336 children with hypertrophied pharyngeal lymphoid tissue; of these, 133 had exuberantly hypertrophied lymphoid tissue on the pharyngeal wall.

The only exception to the generally better results in this group was in the children who complained of cough. Sixty-four children who complained of cough had these pharyngeal "granulations." The results for the complaint of cough in these children as compared with the results in the series as a whole were as follows:

| | Poor, Percentage | Fair, Percentage | Good, Percentage |
|---|---|---|---|
| Group with hypertrophied lymphoid tissue..... | 22 | 25 | 53 |
| All patients with cough..... | 17 | 10 | 73 |

In the children who had little or no such lymphoid hypertrophy before operation there was almost invariably moderate hypertrophy of the lymphoid tissue for from three to six months after operation. This tendency was especially evident in children under 4 years old; it was least evident in those over 10 years old. During the next eighteen months the tendency was for the hypertrophy to decrease somewhat (except in children under 4 years old) but for the tissue to remain slightly hypertrophied.

All but 1 of the children having exuberant hypertrophy before operation showed a recession of the hypertrophy within the first year after operation; it usually remained at the new level during the second year after operation.

It is known that hypertrophy of the lymphoid tissue occurs in response to infection. It has been thought that the lymphoid granules on the pharyngeal wall undergo compensatory hypertrophy after tonsillectomy.[16] The observations on these children are compatible with both those views, for a recession of greatly hypertrophied tissue occurs as the result of the removal of the tonsils and adenoids and the consequent lessened number of local infections, and a compensatory increase occurs in children who had little lymphoid tissue prior to operation.

*Nutrition.*—Since the amount of lymphoid tissue present in children appears to be related to nutrition, a comparison was made between the state of nutrition of the children and the size of the tonsils and adenoids and the amount of pharyngeal lymphoid tissue. No constant relation was found. It is likely that the tendency of lymphoid tissue to hypertrophy in response to infection obscured any relation of lymphoid bulk to body build.

16. Bradley, W. H.: The Tonsils and Nasopharyngeal Epidemics, Arch. Dis. Childhood **5**:335 (Oct.) 1930.

Nutrition bore no relation to the results of the operation. If all the children were divided into three groups, those who were 10 per cent or more underweight for their height and age,[17] those who were average and those who were 10 per cent or more overweight, no difference in results was found between the three groups.

Practically all the children made better than average gains in weight in the two years following operation. The average yearly gains in weight and in height are shown in the table.

Before operation 18 per cent of the children were 10 per cent or more underweight, if their weight was compared with tables of averages, as objective a measure of nutrition as could be applied. At the end of one year after operation the number of underweight children was reduced to 12.5 per cent. At the end of two years after operation 9 per cent were still underweight.

*Gain in Height and Weight After Operation*

| Age of Child | Gain in Pounds | Gain in Inches |
|---|---|---|
| 3 | 5.7 | .. |
| 4 | 5.6 | 2.9 |
| 5 | 5.5 | 2.8 |
| 6 | 5.6 | 2.7 |
| 7 | 6.0 | 2.5 |
| 8 | 7.0 | 2.4 |
| 9 | 7.4 | 2.4 |
| 10 | 7.9 | 2.1 |
| 11 | 9.5 | 2.2 |
| 12 | 9.7 | 2.4 |

The underweight children from 5 to 9 years old gained proportionately somewhat more weight after operation than the children who were younger or older.

An increase in weight following tonsillectomy has been commented on by others, among whom are Paterson and Bray,[18] Kaiser,[19] Keen [4b] and Peller.[20] The phenomenon has been variously attributed to a metabolic change attendant on removal of lymph tissue, to better health because of fewer infections and to the increase in appetite that may follow tonsillectomy. One must also take into consideration the fact that children who are brought in for operation are brought because of

17. According to the tables prepared by Baldwin and Wood, published by The American Child Health Association, New York.

18. Paterson, D., and Bray, G. W.: Tonsillar Hypertrophy and Infection as Factor in Ill-Health, Lancet **2**:1074 (Nov. 24) 1928.

19. Kaiser, A. D.: Effect of Tonsillectomy on Nutrition in Twelve Hundred Children, Am. J. Dis. Child. **23**:139 (Feb.) 1922.

20. Peller, S.: Weitere Untersuchungen über Tonsillen und Wachstum, Klin. Wchnschr. **13**: 299 (Feb. 24) 1934.

parental attention to the child's ill health and that an effort is often made to effect a general improvement in the child's health, so that some of the other dietary or hygienic measures may be at least partly responsible for the gain in weight.

### ANALYSIS OF CASES IN WHICH RESULTS WERE POOR

The results of operation were fair or poor in 90 children. In 14 of these, poor results were not surprising, the preoperative complaints having been rheumatism, pyuria, underweight, asthma, frequent stomach aches, chronic suppurative otitis media and erythema multiforme. But in the remaining 76 the complaints were the usual ones that are expected to be benefited by the removal of the tonsils and adenoids.

Of these 76 children, 35 were under 6 years of age. This is almost one third of the children of that age who were operated on. No other ages were so disproportionately represented.

The complaints that persisted and the number of cases in which they occurred were:

| | |
|---|---|
| Mouth breathing | 36 |
| Cough | 29 |
| Rhinitis | 26 |
| Pharyngitis | 13 |
| Cervical adenitis | 1 |

Cough was almost invariably associated with rhinitis; mouth breathing often occurred alone and pharyngitis usually occurred alone.

Coughs and nose colds were also disproportionately represented, occurring in this group with much greater frequency than in the group that did well.

Of these 76 children only 16 were entirely unimproved. Often in the other 60 children, only one complaint of several remained, or the colds, though still as frequent, were no longer accompanied by the severe systemic reactions that had characterized them prior to operation.

Expressed in percentages, the recapitulation of failures is as follows: Total failure occurred in 5.5 per cent (included in these cases are 2.6 per cent in which the operation was not well advised, leaving 2.9 per cent in which a properly indicated operation failed), and only slight improvement, in 11 per cent.

### DEVELOPMENT OF NEW SYMPTOMS AFTER OPERATION

Sixty-six children presented symptoms of disease of the upper respiratory system after operation that had not been present before operation. Of these, 26 complained of the new symptoms only during

the first year after operation. In the other 40, in whom the new symptoms persisted, the following complaints were found:

| | |
|---|---|
| Cough | 18 |
| Laryngitis | 6 |
| Croup | 6 |
| Cervical adenitis | 4 |
| Otitis media | 4 |
| Rhinitis | 2 |

One of the children with rhinitis complained also of pharyngitis.

These conditions occurred in children at all ages. All the cases of croup were in children under 5 years old; all the cases of laryngitis were in children over 5 years old. The other complaints were in children of various ages. In only 2 were the complaints so severe as to make one conclude that the child was worse off with his new complaints than he had been with the old ones. Obviously, the appearance of the new complaints following tonsillectomy is not necessarily proof of a causal relation.

No predisposition could be found in any one group or type of child to have new complaints after tonsillectomy.

### ANOREXIA

In 282 children anorexia was an incidental preoperative complaint. In 72 of these it remained unimproved after the operation. Anorexia is a symptom so difficult to evaluate without careful study in each case that the figures are included here without comment, for what they may be worth.

### CLINICAL EVIDENCE OF TONSILLAR INFECTION

At the beginning of this study it was thought that ability to determine clinically which tonsils were infected would be of especial importance. As the work progressed it became evident that chronic tonsillar infection (as determined microscopically) was of minor importance as far as infection of the respiratory tract in children was concerned. As previously stated, no relation was found between the degree of the infection of the tonsils and the prognosis; the presence or absence of infection in the tonsils was irrelevant to preoperative complaints or postoperative results.

It does not follow, however, that tonsillar infection is similarly unimportant in adults and in children in cases of infection elsewhere than in the upper respiratory tract. From the voluminous literature and such recent work as that of Rhoads [21] and Jason,[22] among others,

21. Rhoads, Paul S.: Pathologic Changes in the Tonsils, Arch. Otolaryng. **15**:599 (April) 1932.

22. Jason, R. S.: Pathologic Changes in the Human Palatine Tonsils, Arch. Otolaryng. **19**:600 (May) 1934.

it seems likely that chronic tonsillar infection is definitely related to some of the chronic systemic diseases. For that reason these observations on the clinical determination of tonsillar infection may be of value.

The points noted were the size of the tonsils, the degree to which they were buried, the prominence of the crypts, the redness of the anterior pillars, the amount of caseous matter in the crypts and the severity of the cervical adenopathy. An effort was made to find the relation, if any, of each of these clinical findings to the degree of tonsillar infection.

There was a definite relation between the size of the tonsils (by actual weight) and infection. (With a little practice on the part of the physician, the clinical observation of the size comes to agree closely with the actual size.) Big tonsils (weighing over 6 Gm. per pair) were usually infected; small tonsils were less likely to be. The exact figures are: big tonsils, 49 per cent badly infected and 31 per cent moderately infected, and small tonsils, 30 per cent badly infected and 20 per cent moderately infected. The figures for the medium-sized tonsils are practically the same as those for the small tonsils.

Prominence of the crypts usually meant infected tonsils. Of 91 very cryptic tonsils, only 11 showed little or no infection, and of 80 badly infected tonsils only 6 did not have prominent crypts.

The presence of caseous matter was found to be almost uniformly associated with infection. Tonsils of which the crypts contained much caseous matter almost invariably had some cryptic abscesses. Some tonsils, however, with little or no caseous matter were found to be badly infected.

The submerged tonsils did not differ in degree of infection from the other tonsils. Despite the logical assumption that in submerged tonsils the mechanics are such as to favor retention of infection in the crypts, this was not found to be the case. In 2 children one of the tonsils was buried and the other was not; in 1 of the children the buried tonsil was almost invisible when the throat was relaxed while the other tonsil was not at all submerged. In each of these children the buried tonsil was indistinguishable histologically from the other tonsil.

Redness of the anterior pillars is a sign fairly commonly accepted as indicating tonsillar infection. Many authors, e. g., Birkett,[23] Hill[24] and Crowe,[11] definitely stated that it is a reliable sign of infection. In this series of 152 cases in which tonsillar infection was determined by histologic examination, there was no clear relation between redness of the anterior pillars and tonsillar infection. Almost 80 per cent of the children had red anterior pillars, but neither the degree of redness nor

23. Birkett, H. S., in Jackson and Coates,[10] p. 282.
24. Hill, F. T.: Ann. Otol., Rhin. & Laryng. **35**:913 (Sept.) 1926.

its presence correlated consistently with the microscopic picture. In some of the badly infected tonsils the pillars were pale, and in some of the nearly normal tonsils the anterior pillars had the well demarcated zone of redness described by Birkett.[23]

These conclusions, however, are included with some reserve because of the uncertainty in determining just what constituted a properly red pillar. For example, it may well be that some of the pillars that were considered red would not have been so considered if the child had not gagged, if the examination had taken place a week or so longer after a receding infection of the throat or, perhaps, if viewed by a different observer.

## COMMENT

It must be recognized first that the results obtained by tonsillectomy and adenoidectomy cannot properly be attributed more to the removal of tonsils than to the removal of adenoids or vice versa. It may well be that in many cases the removal of the one or the other alone would have effected just as satisfactory a result as the removal of both. Any attempt to attribute the results more to the one operation than to the other can only be speculative, although many clinicians have expressed the opinion that it is from adenoidectomy rather than from tonsillectomy that the child derives his main benefit.

Undoubtedly, a certain number of these children would have improved spontaneously without an operation. Study of a series of 500 control children, who needed tonsillectomy as badly as these children but did not have the operation, would have answered that question. The idea of having such a series was seriously considered at the beginning of this study, but it was thought that it would only create the illusion of a control series, since the parents of children who really needed tonsillectomy would be unlikely to continue to postpone the operation for two years and the remaining so-called controls would consist mainly of the children with milder complaints. A real control series did not appear possible.

Many published studies of series of cases attest abundantly to the symptomatic relief obtained through operation. Much of the recent literature has emphasized the necessity of proper indications if one is to avoid a disappointing result. The acceptance in many instances of flimsy and far fetched indications for tonsillectomy has led to a definitely pessimistic attitude about the benefits to be expected. Yet, as Hill [24] pointed out, if there is a proper indication and the operation is well done, the results should not be disappointing.

The prime indications for tonsillectomy and adenoidectomy in children are mechanical obstruction and frequent infections of the nose

and throat, with their closely related accompaniments. Reports have repeatedly demonstrated that the operation gives a gratifying result in from 70 per cent to 85 per cent of the cases in which such indications are present. Of the types of infection of the upper respiratory tract, repeated attacks of pharyngitis, tonsillitis or cervical adenitis are definite indications. Whether repeated head colds or frequent coughs are indications must, obviously, in each case be a matter for personal judgment; one must weigh the severity of the infections against the seriousness of the operation in the light of the known likelihood of improvement for that type of symptom. One would hesitate, for example, to remove the tonsils and adenoids of a 3 year old child for the complaint of cough even though attacks were frequent and fairly severe; in that same child, however, the complaint of marked obstruction by the adenoids would warrant adenoidectomy despite the frequent partial failures of the operation at that age.

One of the most confusing of the issues has been the dictum that an infected tonsil should come out. That dictum was transferred directly to pediatrics from medicine as it deals with the adult. It sounds so reasonable that it has rarely been questioned. There are two objections to it. The first is that it usually has no bearing on the situation in children, whose tonsils are removed usually because of infections of the upper respiratory tract. The second objection is that even if infected tonsils ought to be removed, the dictum is valueless because the physician admittedly does not know an infected tonsil when he sees one. As pointed out previously, there is not even agreement as to the diagnosis of infection on microscopic examination, let alone on clinical examination. If, as de Veer [10] stated, abscessed crypts are practically universal beyond infancy, perhaps they are normal. Dean [1] frankly stated that he could not identify a chronically diseased tonsil "except after removal and microscopic study," and he went on to add that "the history of acute tonsillitis is a more reliable indication of chronic infection than the appearance of the tonsils."

There is nothing in this study to lead one to feel that the appearance of the tonsils should ever influence one's judgment as to the advisability of removing them for the improvement of the child's health. It seems that for children at least it would have a salubrious effect on the physician's attitude if he abandoned the stereotyped "diseased and hypertrophied tonsils and adenoids" and substituted "frequent sore throats" or whatever the complaint and indication is in each case.

Age ought definitely to be taken into consideration. Under 4 years of age, 50 per cent of the children in this study were little benefited by

tonsillectomy and adenoidectomy if frequent coughs or colds were the complaints. Under 6 years of age, 30 per cent remained unimproved or only slightly improved in the case of all complaints except sore throat. This figure does not compare favorably with that for results in children over 6 years old, of whom only 10 per cent remained unimproved.

The results in these 540 children are somewhat better than those reported by most observers. A possible explanation of the generally fairly good results may be the care with which these children were selected for operation. The situation was unlike that in private practice; there was no parental pressure to warp the judgment of the pediatricians who made the original recommendations. Nor was there any obligation to accept the school teacher's or the visiting nurse's snap judgment that the tonsils ought to come out. And the knowledge that their signed decisions would be reviewed by the otolaryngologists added a little extra spur to the pediatricians' conservatively considered judgments.

## SUMMARY AND CONCLUSIONS

Five hundred and forty children between the ages of 2 and 13 years were observed before and at intervals for two years after tonsillectomy and adenoidectomy.

Histologic sections of the tonsils of 152 of these children were studied. Practically all these tonsils showed a greater or less degree of infection or connective tissue scars or both.

Large tonsils were almost always infected. Buried tonsils did not differ histologically from others. Redness of the anterior pillars was not a reliable indication of infection. Tonsils that were cryptic usually contained more caseous material. Tonsils with much caseous material almost invariably had cryptic abscesses.

No correlation was found between the type or degree of the tonsillar infection and the type or severity of the preoperative symptom or the result of the operation. Whether the tonsils were buried, cryptic, smooth, large or small bore no relation to the preoperative symptoms or to the degree of success of the operation.

Very good results were obtained with children of all ages in the relief of sore throat and of cervical adenitis; good results, in the relief of mouth breathing; fairly good results, in the relief of cough, and fair results, in the relief of frequent head colds.

Except in cases of tonsillitis or pharyngitis, the results for all complaints were only fair in children under 6 years old. With the complaints of cough and head colds the results were especially poor, particularly in children under 4 years old.

In view of the findings it was concluded that (*a*) more consistently good results may be expected if the operation of tonsillectomy and adenoidectomy is postponed until the child is 6 years of age or older, especially if head colds or cough is the complaint, and (*b*) except in the estimation of mechanical obstruction, the appearance of the tonsils in children is unimportant to the physician in arriving at a decision as to the advisability of the operation.

The members of the social service department of the hospital assisted in getting these children to return to the clinic after their operations.

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# FAMILIAL METAPHYSIAL DYSPLASIA

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Two siblings with an unusual disease of the bones were recently observed:

CASE 1.—J. H., a white boy of Irish-American parentage, was admitted to the Bellevue Hospital in October 1933 and again in January 1936 because of knock knee. He was born Oct. 10, 1926. Labor was normal, and the weight at birth was 3,380 Gm. He was artificially fed after the second month of life and received cod liver oil and orange juice at an early age. Development was normal; the child teethed, walked and talked at about the normal age. There were no illnesses except pertussis, at the age of 6 years.

The father and mother were well. Roentgenograms of their long bones were normal. The condition of the sister, 6 years old, was similar to that of the patient. There was no history of deformity of the bones in any of the relatives.

The chief complaint was knock knee. This was first noted when the patient was about 18 months of age, and it became progressively worse. When he was 3 years old a double femoral osteotomy was performed. At that time there was limitation of extension at the elbows, and the peculiar roentgenologic appearance of the bones was fully developed; this appearance has been described by Pyle.[1] At operation the periosteum was seen to be normal, but the bone beneath it was very soft. The bones healed normally.

In October 1933 the boy was admitted to the Bellevue Hospital. Knock knee had recurred, and double tibial osteotomy was performed. The fractures healed promptly, but there was only temporary improvement, and in January 1936 the child was readmitted to the hospital with the same complaint.

In January 1936 the patient was 9 years old. He was tall and frail, and his lower extremities appeared unusually long. The deciduous teeth were still present, and several showed deep caries. There was one small accessory central lower incisor. The humeri could be felt as unduly prominent below the shoulder joints. Extension at the elbows was limited about 15 degrees. There was well marked bilateral knock knee. Fusiform expansion of the lower ends of the femurs and the upper ends of the tibias was palpable. There was bilateral weak foot. The finger-nails were slightly clubbed but were not otherwise defective. The genitalia were normal. The remainder of the examination gave negative results.

Roentgenologic examination of the long bones showed a striking appearance (fig. 1). The peculiar changes were symmetrical and were present in all the

From the children's medical service of Bellevue Hospital and the department of pediatrics and the department of orthopedic surgery of the New York University Medical College.

1. Pyle, E.: Case of Unusual Bone Development, J. Bone & Joint Surg. **13**: 874, 1931.

bones of the extremities except those of the feet. The proximal halves of the clavicles were also involved, and there were suggestive changes in the ribs. The vertebrae, pelvis, skull and face appeared normal. The condition affected mainly the bony metaphyses. The changes were most striking in the femurs. The configuration was extraordinary, resembling that of the cypress tree, with its broad expansion at the base. The femurs were greatly elongated. The long axes were

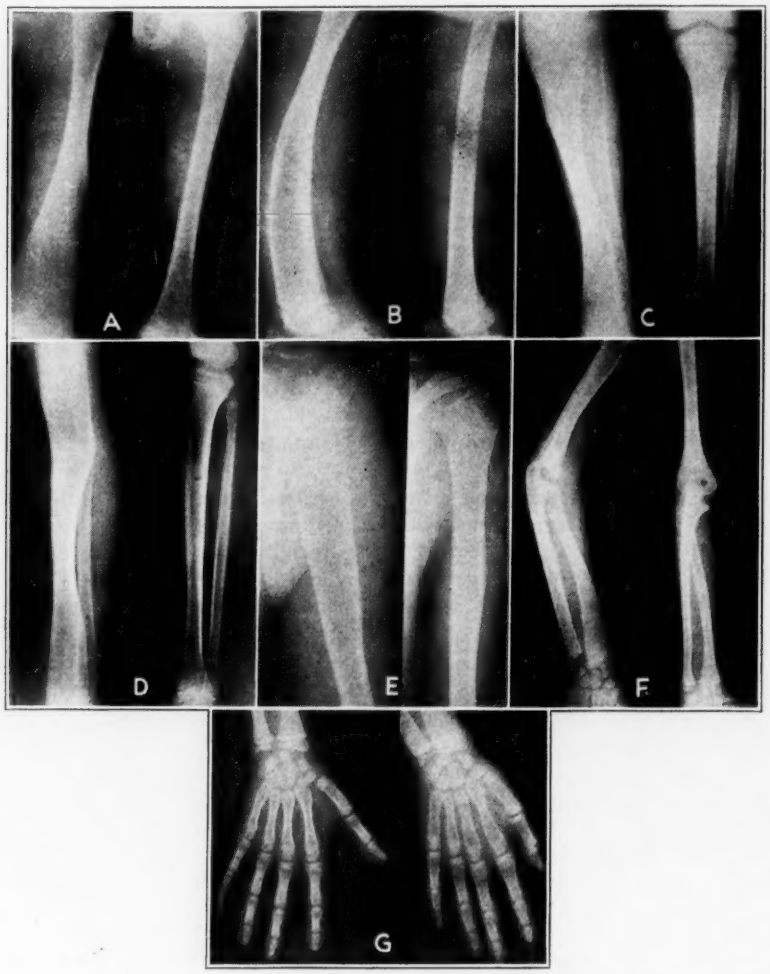


Fig. 1.—Comparison of the bones of J. H. (case 1) with those of a normal boy of the same age: *A*, femur, anteroposterior view; *B*, femur, lateral view; *C*, tibia, anteroposterior view; *D*, tibia, lateral view; *E*, humerus; *F*, radius and ulna, and *G*, hand.

directed inward more markedly than normal. The outlines of the bones were smooth throughout, and the periosteum was nowhere visible.

The upper ends of the femurs were somewhat expanded and showed to a minor degree the structural changes noted in the lower halves. Starting some-

what above the middle, the femurs expanded in both their transverse and their sagittal diameters as far as the condyles. The internal margins were markedly convex below the center. The femurs were bowed anteriorly. In the involved portions of the bones the cortex was thin and sharply demarcated. The bones were more transparent to the roentgen rays than normal, and a fine, regular, dense interlacing network was visible. The sites of the osteotomies done six years previously were still visible as fine irregular transverse lines in each femur. In the lateral views a broad rarefied zone, extending axially, was visible.

The tibias were similarly affected in their proximal and distal thirds, more markedly in their proximal thirds. The bones were sinuously curved, with an inward convexity above and an outward convexity below. The sites of the osteotomies done in 1933 were seen as narrow dense lines traversing the bones. The fibulas were cylindric. The middle thirds were normal, but both the upper and the lower thirds were expanded and showed changes in texture and in cortical thickness similar to those observed in the femurs and tibias.

The humeri in their proximal two thirds were greatly expanded and osteoporotic. The radii in their distal halves were similarly expanded and showed the osteoporosis, cortical thinning and interlacing network seen in the bones of the lower extremities. The distal halves of the ulnas were slightly expanded, appeared

TABLE 1 (case 1).—*Structure of the Blood*

| | |
|---|---|
| Red blood cells, per cubic millimeter | 3,980,000 |
| Mean diameter of red blood cells, microns | 6.9 |
| Hematocrit, volumes per cent | 37.5 |
| White blood cells, per cubic millimeter | 6,800 |
| Segmented forms, percentage | 33.0 |
| Stab forms, percentage | 8.5 |
| Juvenile forms, percentage | 2.0 |
| Myelocytes, percentage | 1.0 |
| Basophils, percentage | 1.0 |
| Eosinophils, percentage | 5.5 |
| Lymphocytes, percentage | 47.5 |

cylindric and showed the changes observed in the other long bones. The proximal halves of the clavicles were similarly affected, and the metacarpal bones showed the same changes. The feet were normal. The ribs also appeared to be involved, but the changes could not be definitely determined. Ossification of the carpal centers was normal.

The red blood cell count was somewhat reduced, as was the hemoglobin content (table 1). The white cells were normal except for persistent eosinophilia, the proportion being about 5 per cent.

The blood, examined in January 1936 and again in June 1936, showed no abnormalities in chemical composition (table 2). On the first examination the amount of readily hydrolyzable phosphorus was low and that of acid-insoluble phosphorus (largely lipoid phosphorus) was high, but on the second examination these were within normal limits.

The result of the dextrose tolerance test was normal. The reaction to the intracutaneous tuberculin test was positive. Roentgen examination of the chest gave negative results. The blood pressure was 108 systolic and 70 diastolic. The electrocardiogram was normal. Repeated examinations of the urine gave negative results. The intelligence quotient was 90.

Anthropometric measurements (table 3) showed that the patient was unusually tall. The increase in height was due entirely to the great length of the lower extremities, the sitting height being normal. The femur, measured from the

anterior superior spine of the ilium to the lower margin of the external condyle, was 432 mm., which is 35 mm. greater than the mean for boys at the age of 9¼ years. This measurement is within the normal range but is in the uppermost 10 per cent for a series of 114 normal boys. The tibia, measured from the lower margin of the internal condyle of the femur to the tip of the internal malleolus of the tibia, was also unusually long, measuring 322 mm., which is 33 mm. greater than the mean for a series of normal boys of the same age as the patient.

TABLE 2 (case 1).—*Chemical Constituents of the Blood per Hundred Cubic Centimeters*

| | Jan. 22, 1936 | June 16, 1936 |
|---|---|---|
| Whole blood carbon dioxide, cc | 52.1 | 50.3 |
| Plasma sodium chloride, mg | 596.0 | 608.0 |
| Serum proteins, Gm | 5.9 | 6.9 |
| Serum calcium, mg | 10.8 | 9.7 |
| Serum inorganic phosphorus, mg | 5.7 | 4.3 |
| Serum phosphatase, units | 10.3 | 10.3 |
| Nonprotein nitrogen, mg | 28.0 | 32.0 |
| Sugar, mg | 107.0 | .... |
| Serum total cholesterol, mg | 197.0 | 172.0 |
| Total base, milliequivalents per liter | 153.0 | .... |
| Hemoglobin, Gm | 12.6 | .... |
| Whole blood inorganic phosphorus, mg | 3.1 | 3.6 |
| Whole blood readily hydrolyzable phosphorus, mg | 2.8 | 5.1 |
| Whole blood total acid-soluble phosphorus, mg | 25.9 | 24.7 |
| Whole blood total phosphorus, mg | 54.0 | 46.0 |
| Whole blood acid-insoluble phosphorus | 28.1 | 21.3 |

TABLE 3.—*Comparison of the External Dimensions of J. H. and P. H. with Those of Normal Children of the Same Age and Sex*

| | J. H., 9 yr., 3 mo. Mm. | Normal,* 9 yr., 3 mo. Mm. | P. H., 6 yr., 9 mo. Mm. | Normal,* 6 yr., 9 mo. Mm. |
|---|---|---|---|---|
| Total body length | 1,412 | 1,308 | 1,224 | 1,180 |
| Sitting height | 704 | 705 | 647 | 645 |
| Length of femur | 432 | 397 | 370 | 337 |
| Length of tibia | 322 | 289 | 267 | 249 |
| Length of humerus | 243 | 248 | 207 | 214 |
| Length of radius | 200 | 193 | 157 | 165 |
| Length of hand | 151 | 144 | 131 | 129 |
| Length of middle finger | 79 | 73 | 67 | 65 |
| Weight (kilograms) | 28.75 | 28.88 | 21.46 | 20.60 |
| Biacromial diameter | 272 | 278 | 259 | 250 |
| Biiliac diameter | 210 | 211 | 182 | 188 |

* From unpublished data by H. Bakwin and R. M. Bakwin.

The length of the upper extremities was normal, as were the other external dimensions of the body.

CASE 2.—P. H., a girl, the only sibling of J. H., was born Sept. 3, 1929, weighing 4,550 Gm. She was artificially fed from birth and received cod liver oil and orange juice at an early age. Development was normal. The only previous illnesses were measles and pertussis, at the age of 3 years. There were no complaints except bilateral weak foot.

In June 1936 the child was 6¾ years old. She was a tall, thin, frail-looking child. The lower extremities appeared disproportionately long. The deciduous teeth and the 6 year molars were all present, without caries. There was marked

internal strabismus. The child was albinotic. The humeri felt unduly prominent below the shoulder joints. Extension at the elbows was limited about 10 degrees. There were mild knock knee and bilateral weak foot. The lower ends of the femurs and the upper ends of the tibias felt unusually broad. The finger-nails were normal. The genitalia were normal, and there was a small amount of hair over the mons.

Roentgenologic examination of the bones (fig. 2) showed changes identical in appearance and distribution with those in the older brother.

Ossification of the carpal centers was normal. The blood contained the normal amount of calcium, inorganic phosphate, phosphatase, cholesterol, chlorides and sugar. The structure of the blood was normal. There was no eosinophilia.

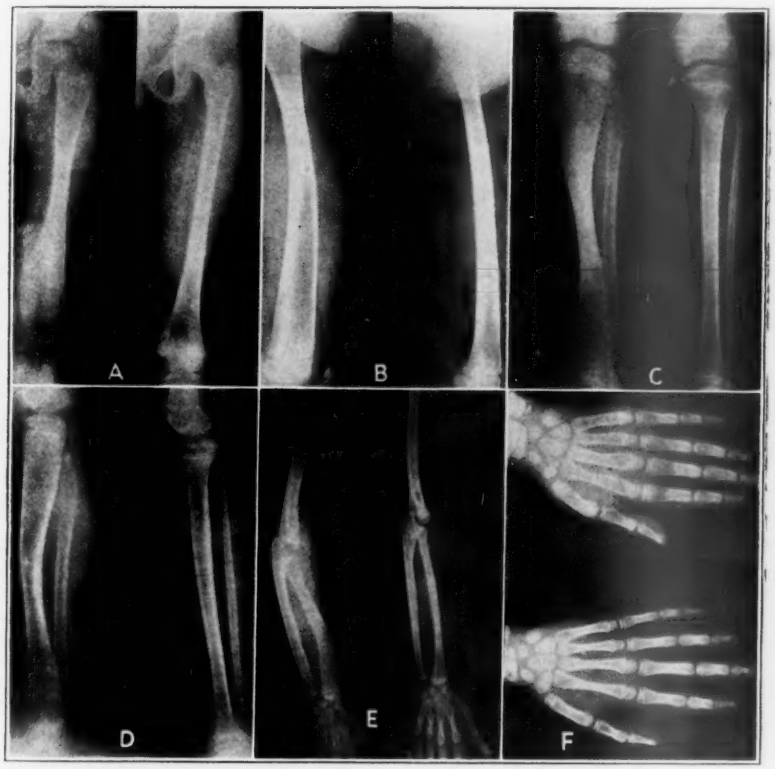


Fig. 2.—Comparison of the bones of P. H. (case 2) with those of a normal girl of the same age: *A*, femur, anteroposterior view; *B*, femur, lateral view; *C*, tibia, anteroposterior view; *D*, tibia, lateral view; *E*, radius and ulna, and *F*, hand.

Anthropometric measurements showed the same changes as those in case 1 (table 3). The child was unusually tall, and the increase in height was due entirely to the increase in length of the femurs and tibias. The sitting height was normal. All other external dimensions were normal.

A survey of the literature failed to reveal a clinical description of this condition except for the brief account of case 1 by Pyle,[1] published in 1931.

The disease in these children resembled a condition in a cadaver described by Hamann [2] in 1910 and more extensively studied by Ingalls [3] in 1933. The bones were obtained from a tall, thin man who had apparently died of tuberculosis. The abnormalities were observed only in the lower halves of the femurs, in the upper halves of the tibas and in the fibulas, but all the bones were not examined.

The femurs were symmetrical. The bony surfaces were smooth, unusually white and without evidence of osteal or periosteal inflammation. The articular surfaces showed no evidence of disease. The femurs were unusually long but were within normal limits. From about the middle of the shaft the femurs expanded in their transverse diameters and to a lesser extent in their sagittal diameters as far as the condyles. The internal borders of the femurs below the center were unusually convex.

The tibias were markedly expanded in their proximal halves, the increase in size being more conspicuous in the transverse than in the sagittal diameter. In addition, there was marked bowing, the most marked convexity being on the inner sides just above the centers.

Section of the left femur showed that the process had affected the entire thickness of the shaft. The most striking features were the enormous amount and density of the cancellous bone and the extremely short medullary cavity. The dense bone of the shaft, at the level of the marrow cavity, was thicker than that in most femurs, while the cortical layer in the distal portion was thinner. The tibia had a similar appearance. The cancellous bone was dense and somewhat irregular, and the characteristic disposition and arrangement of the finer osseous lamellae were defective. Extending axially through the cancellous tissue was a broad zone, apparently a continuation of the bone marrow cavity, in which the spongy bone was somewhat less dense than elsewhere and distinctly more irregular in structure.

Ingalls referred to bones of a man of the archaic period found by Jones [4] in ancient Nubian material in the large cemetery at Dehmit. The lower half of the left femur and the upper half of the left tibia were greatly enlarged and thickened.

## COMMENT

An unusual generalized disease of the bones in two siblings is described. The condition is symmetrical and is characterized by marked expansion of the metaphyses of the long bones (the distal halves of the femurs, the proximal and distal thirds of the tibias and fibulas, the proximal two thirds of the humeri, the distal halves of the radii and ulnas, the bones of the hand, the clavicles and probably also the ribs). The femurs and tibias are unusually long. The diseased portions of the

2. Hamann, C. A.: An Abnormality in the Form of the Femur, Cleveland M. J. **9**:710, 1910.

3. Ingalls, H. W.: Bone Growth and Pathology as Seen in the Femur (and Tibia), Arch. Surg. **26**:787 (May) 1933.

4. Smith, G. E., and Jones, F. W.: The Archaelogical Survey of Nubia: Report for 1907-1908; Report on the Human Remains, Cairo, 1910, vol. 2, p. 289, plate 48, fig. 4; cited by Ingalls.[3]

bones show cortical thinning, osteoporosis and a dense interlacing trabecular formation. The bony outlines and the articular surfaces are clean. There is moderate osteomalacia, as indicated by the curving of the bones of the lower extremities. The spinal column is not involved.

The occurrence in two siblings indicates that the condition is familial. The parents were normal and there was no history of bony deformity in the relatives. The condition manifests itself early in life, knock knee having been noted at the age of 18 months in one of our patients.

The fully developed changes in the bones were noted by Pyle when the patient was 3 years of age. Examination by Ingalls of a femur of a cadaver with a condition apparently identical with the disease in these patients showed a short medullary cavity surrounded by unusually dense bone. In the involved portion of the bone the cortex was thin and the cancellous bone greatly increased in amount and somewhat irregularly distributed.

Clinically, the condition manifests itself by knock knee, weak foot, palpable expansion of the upper ends of the humeri and of the femurs and the tibias about the knees, limitation of motion at the elbows and unusual length of the thighs and legs. There are no characteristic changes in the structure or chemistry of the blood.

The condition is apparently not progressive and does not appear to interfere with the general health.

SUMMARY

An unusual developmental disease affecting the metaphyses of the long bones in two siblings is described.

# Case Reports

## CHRONIC SUBDURAL HEMATOMA IN A NEWBORN IDENTICAL TWIN

### OPERATIVE REMOVAL, WITH RECOVERY

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Chronic subdural hematoma is a fairly well known pathologic lesion, and many interesting and instructive papers have been written on the subject. Accumulation of blood in the subdural space follows injury to the head, and the symptoms and signs of such an expanding lesion usually appear anywhere from several weeks to several months after the injury. There is a tendency, I believe, for physicians to consider chronic subdural hematoma a disease of adults, although cases have been reported in which the patient was 13 or 14 years of age. That this condition may occur at any age is clearly shown by the following case.

### REPORT OF CASE

The patient, a boy 21 days at the time of craniotomy and evacuation of a large subdural hematoma, was an identical twin, the second of the twins to be born. The first twin was born spontaneously at 5:05 p. m.; the second had a frank breech presentation, which was converted to a single footling presentation, and was manually extracted by the Mauriceau-Smellie-Viet method at 5:29 p. m. A forceps was not employed. The second twin weighed 2,484 Gm.; the first weighed 2,276 Gm. Each was 46.5 cm. in length. The patient's head was 33 cm. in circumference and the thorax 29.5 cm. At birth the patient was cyanotic, and he was placed in an incubator. Feedings were either refused or taken poorly. About forty-eight hours after birth, oxygen therapy was started. The infant's temperature remained normal, but cyanosis persisted in spite of the oxygen therapy. Two weeks after birth his skin was still very dark, in contrast to that of his brother, which was fair.

General physical examination revealed no evidence of a cardiovascular lesion which might explain the cyanosis, and the lungs seemed normal on auscultation and percussion. The child's head was large, markedly so in comparison with his brother's. The circumference was 35 cm., and the cranial sutures were abnormally separated, with enlargement of the fontanels, indicating increased intracranial pressure. The right half of the head was more prominent than the left. The head did not transmit light. The child was drowsy but when stimulated moved his extremities, all equally well, there being no evidence of paralysis. There was no cervical rigidity.

The patient's head continued to increase in size, and his general condition did not improve. Lumbar puncture was tried but was unsatisfactory. Results of exam-

From the Section on Neurologic Surgery, the Mayo Clinic.

ination of the ocular fundi were as follows: "Disks rather pale, with exaggerated rings and some glial blurring, but not more marked than in the average baby of this age. No lesion seen." It was felt that the child had an intracranial lesion, the exact nature of which was unknown. Further, it was felt that the condition was congenital or at least had been present since birth. The conditions considered in the differential diagnosis were: congenital hydrocephalus, porencephalia, aplasia of the brain, neoplasm and hematoma. Failure of the head to transmit light excluded aplasia of the brain [1] and internal hydrocephalus of marked degree. Porencephalia, neoplasm and hematoma were then to be considered.

On June 17, 1936, a spinal puncture needle was introduced into the anterior horn of the right lateral ventricle through the anterior fontanel. Slightly hemorrhagic fluid was obtained, in all about 8 or 10 cc. About 20 cc. of air was then injected slowly, and during this procedure an assistant who was holding the child's

Ventriculogram showing the dilatation and the displacement to the right of the third ventricle.

head said, "The head is getting tense," thus indicating that sufficient air had been injected. Another spinal puncture needle was inserted through the left angle of the anterior fontanel in an attempt to recover more fluid from the ventricular system. No fluid could be obtained, but air escaped through the puncture hole, thus indicating that the ventricular system had been entered. Examination of the ventricular fluid disclosed the following facts: The Wassermann and the Kline test were negative, and many erythrocytes and 7 small lymphocytes per cubic millimeter were present. There was insufficient fluid for Nonne's test.

1. Love, J. G.: Transillumination of the Head: An Aid in the Diagnosis of Hydrocephalus, Proc. Staff Meet., Mayo Clin. **10**:527-528 (Aug. 14) 1935.

Roentgenograms of the child's head were made after the introduction of air into the ventricles. These revealed an abnormally large right lateral ventricle and little or no air in the left ventricle. In the postero-anterior roentgenogram (fig. 1), the third ventricle appeared as a dilated cavity displaced to the right of the midline of the skull. These findings, of course, indicated an expanding lesion in the left temporal region, with encroachment on the left lateral ventricle sufficient to cause its occlusion and on the third ventricle sufficient to displace it to the right and to cause a dilatation of the right lateral ventricle, as well as of the third ventricle, owing to interference with the normal escape of cerebrospinal fluid from the ventricular system.

A diagnosis of intracranial hematoma on the left side was then made, and operative removal was advised, although it was realized that the risk would be great. I felt that tumor was excluded because of the fact that the identical twin was normal and a neoplasm would be unlikely at this age unless present in both twins. The history of breech presentation suggested the possibility of intracranial hemorrhage at the time of delivery. Furthermore, the absence of neurologic findings in the presence of an obviously large expanding lesion in the region of the temporal lobe seemed to militate against an intracerebral lesion. It was felt, therefore, that a hematoma about the temporal lobe and the base of the brain rather than in the substance of the brain was being dealt with.

On June 19, after local infiltration of the scalp (with 1 per cent procaine hydrochloride), a straight vertical incision was made anterior to the left ear, and a small piece of bone (1 cm. by 1 cm.) was removed by means of a scalpel and scissors. Bluish, discolored dura mater bulged into the decompression opening. The appearance was characteristic of an underlying chronic subdural hematoma. When the dura mater was incised, a true membrane was found inclosing old, dark blood. This membrane bulged above the level of the decompression opening in the skull. The membrane was then nicked with a sharp hook, and old blood spurted into the air for a distance of 5 inches (13 cm.), thus indicating the pressure that it was under. Five ounces (150 cc.) of this old blood was recovered after a considerable quantity had escaped on the drapes. The child's head immediately became much smaller, and the bones of the skull overrode one another, causing concern regarding the possibility of further hemorrhage. The left middle meningeal artery was visualized and was found to be normal. The cavity from which the old blood escaped was irrigated with physiologic solution of sodium chloride at 99 F. until the fluid returned clear. There was no fresh bleeding. The main bulk of the hematoma was underneath the left temporal lobe. A Penrose drain was left beneath the lobe, and the wound was closed with dural silk sutures. Immediately on release of the accumulation of old blood the patient's color became normal. The Penrose drain was removed at the end of twenty-four hours.

There was no further bleeding. For four days following operation the patient's rectal temperature ranged from 99 to 103 F. On the fifth day it became normal, and it remained so throughout his period of observation. The patient was dismissed on July 4, at which time the circumference of the head was 34 cm. and the body weighed 2,974 Gm. The child was nursing well, and his general condition was excellent.

# LUDWIG'S ANGINA DUE TO THE HEMOLYTIC ENTEROCOCCUS

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AND
GEORGE S. YOUNG, M.D.
BUFFALO

A case of Ludwig's angina is presented because of the unusual etiology.

## REPORT OF CASE

A girl 17 months of age with a history of frequent sore throat had been treated for impetigo on the face for one week. At the end of that time a swelling of the neck was noted, and the child was admitted to the Children's Hospital.

On her admission, the physical examination revealed the presence of a few maculopapular crusting lesions at the right eyelid and on the face. There was a large swelling in the right submaxillary region. The tonsils were only slightly enlarged, and no membranes or ulcerative lesions could be seen in the throat. The temperature was between 100 and 101 F. The physical examination showed an otherwise normal child. The blood had a hemoglobin content of 79 per cent. The blood count showed 17,050 leukocytes, with 70 per cent segmented and 15 per cent nonsegmented polymorphonuclear cells, 12 per cent lymphocytes and 3 per cent monocytes. A culture revealed no diphtheria bacilli.

The next morning the swelling had increased remarkably and changed in character to a severe hemorrhagic-necrotic cellulitis, involving the whole neck and the upper anterior part of the chest. The floor of the mouth was considerably raised. The temperature was 105 F. Ludwig's angina was diagnosed. A drainage was scheduled, but before it could be performed the child suddenly died.

Immediately after her death cultures of the exudate from the lesion and of the heart blood were made under sterile precautions. The fluid obtained from the hemorrhagic-necrotic area contained a moderate number of leukocytes and occasional gram-positive diplococci; the culture revealed a pure growth of streptococci. After twenty-four hours' incubation at 37 C. the colonies on the blood agar plate were surrounded by a zone of greenish discoloration; after forty-eight hours' incubation, however, marked hemolysis was present. On subculture hemolysis occurred after twenty-four hours' incubation. Further examination of the streptococci showed them to be bile-insoluble cocci in short chains which fermented esculin. The organisms, therefore, belong to the group of Enterococcus and may be called Enterococcus haemolyticus. The blood culture showed the presence of more than 300 colonies of a micro-organism with identical properties (Enterococcus haemolyticus).

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From the laboratories of the Children's Hospital, Buffalo, and of the Department of Pathology and Bacteriology, University of Buffalo, School of Medicine.

Studies of the fibrinolytic properties of the exudate obtained from the necrotic lesion as well as of the isolated strain of the hemolytic enterococcus were also undertaken. According to previous experiments,[1] there are two different substances of bacteria which come from human sources:

1. A fibrinolysin first described by Tillett and Garner [2] and produced only by hemolytic streptococci (with the exception of rare strains of staphylococci). This type of fibrinolysin dissolves clots in the plasma of human beings, but is without effect on the plasma of animals. The fibrinolysin is produced in plain infusion broth in rather large quantities and may be neutralized by specific antiserums.

2. An anticoagulant is produced by a variety of micro-organisms, such as Enterococcus, Streptococcus viridans, Pneumococcus and various bacilli. It inhibits coagulation of the plasma of human beings as well as that of animals. It is produced in small quantities in dextrose infusion broth and thus far has not been neutralized by specific antiserums.

Fibrinolysin not only is produced in vitro, but has been found to be present in vivo.[3] In the case of our patient the exudate obtained from the hemorrhagic lesion, as well as the supernatant fluid of the dextrose broth culture of the isolated strain, proved to be anticoagulant. The anticoagulant had the properties of the nonspecific, second type, which is characteristic of enterococci.

## COMMENT

Enterococci are normally present in the intestinal tract of man. There can be no doubt, however, that such esculin-fermenting streptococci may become pathogenic. The viridans and nonhemolytic types of the enterococcus have been encountered as causative agents in infections of the urinary and intestinal tracts and in rare cases of subacute bacterial endocarditis. There are a few reports in the literature concerning the pathogenicity of the "hemolytic" type of the enterococcus.[4] In the case here reported the hemolytic enterococcus was the cause of Ludwig's angina.

The question arises whether the "hemolytic" type of the enterococcus is more closely related to the hemolytic streptococcus or to the enterococcus. The enterococcus thus far has never been found to produce the specific type of fibrinolysin which is formed by the majority of strains of the hemolytic streptococcus. Further studies are necessary to determine whether or not hemolytic enterococci produce only the nonspecific type of anticoagulant. This may help in the classification of the "hemolytic" enterococcus. In the case of our patient the hemolytic

1. Witebsky, E., and Neter, E.: Proc. Soc. Exper. Biol. & Med. **34**:858, 1936.

2. Tillett, W. S., and Garner, R. L.: J. Exper. Med. **58**:485, 1933.

3. Neter, E.: Proc. Soc. Exper. Biol. & Med. **34**:735, 1936.

4. Meyer, K.: Klin. Wchnschr. **6**:2045, 1927. Ehrismann, O.: Ztschr. f. Hyg. u. Infektionskr. **118**:464, 1936.

enterococcus produced the nonspecific type of anticoagulant characteristic of the enterococcus. This anticoagulant is not an artificial product, since we could demonstrate its presence in the exudate of the lesion.

## SUMMARY

A case of Ludwig's angina caused by a hemolytic enterococcus which invaded the blood stream is presented.

Anticoagulant of the nonspecific type could be observed in the exudate of the lesion as well as in cultures.

# LAURENCE-MOON-BIEDL SYNDROME

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In 1866, Laurence and Moon first pointed out a syndrome known in later literature (1930) as the Laurence-Moon-Biedl syndrome, the prominent clinical manifestations of which are adiposogenital dystrophia (Fröhlich's syndrome), atypical retinitis pigmentosa, often without the concomitant hyperpigmentation, mental deficiency, familial incidence and skeletal abnormalities, the most frequent of which are polydactylism, usually asymmetrical and postaxial (e. g., toward the little finger or toe), syndactylism and deformity of the skull. Since that time a total of eighty-seven cases have been presented in the literature of the world. In no case, however, was it reported that there was more than one extra digit on a single extremity, although numerous records can be found of a single extra digit on more than one extremity. Males seem to be more often affected than females, but definitely more cases have been reported among the English and the Germans than among other peoples.

Not all the patients for whom this diagnosis has been made presented the complete symptom complex. Reilly and Lisser,[1] in their survey, found twenty-five cases in which the classic syndrome was complete, ten cases in which it was questionably complete, twenty-seven in which it was partially complete, one in which the diagnosis was questionable and fifteen in which it was doubtful.

The following case is reported not only because of its clinical interest but also because so many of the features described in the original papers on the Laurence-Moon-Biedl syndrome were present that a question arises as to whether it should not be included among the cases of that syndrome. Also, if Cockayne, Krestin and Sorsby's observation [2] (April 1935) regarding the extra digits on a single extremity has not been affected by subsequent reports, this case will be unique in that the child had two extra digits on each hand and one extra digit on each foot, symmetrically distributed.

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From the Wrentham State School.

1. Reilly, W. A., and Lisser, Hans: Laurence-Moon-Biedl Syndrome, Endocrinology **16**:337 (July-Aug.) 1932.

2. Cockayne, E. A.; Krestin, David, and Sorsby, Arnold: Obesity, Hypogenitalism, Mental Retardation, Polydactyly and Retinal Pigmentation—The Laurence-Moon-Biedl Syndrome, Quart. J. Med. **4**:93 (April) 1935.

## REPORT OF A CASE

Phyllis C., a premature (8 month) child, was born in Rhode Island on May 21, 1921. The family history showed no syphilis, tuberculosis or disease of the skeletal, cardiac, renal, gastro-intestinal or nervous system. Both parents were native born and of English ancestry. The father graduated from grammar school, and the mother completed the eighth grade. The father died in 1924, at the age of 35 years, of a ruptured appendix. The mother at the time of writing is 42 years old and well, although she appears to the observer somewhat emotionally unstable. There was one sibling, a girl aged 19, who was said to be normal both mentally and physically. Phyllis was the product of the third conception. Between the two living siblings there was one miscarriage, but there was no history of stillbirths. The mother's father was one of twins. The maternal and paternal cousins, numbering about seventeen, were considered normal physically and mentally.

Delivery was accomplished without instruments after a prolonged labor following an uneventful gestation. The maternal diet was adequate in all the basic nutritional elements, and there was no undue emotional stress. The child weighed between 3,400 and 3,600 Gm. at birth. (The prematurity may be questioned on this basis.) It was noted that there were an extra digit on each foot (two great toes) and two extra digits on each hand, one growing laterally from the metatarsal bone of the little finger and one growing toward the palm from the base of the fourth finger, on the radial surface. Because of the unusual breadth of the lower extremities, the child was forced to assume a position in which she extended her legs laterally.

The early physical development was only slightly retarded, dentition starting between the ages of 6 and 8 months, walking at 18 months and talking at 2 years. The child's slowness and general retardation became more apparent after the age of 2 years. At the age of 4 years, when she was hospitalized for the excision of the supernumerary digits, her mental age was thought to be at least 1 and possibly 2 years under her chronological age. This was not confirmed at the time, however, by any of the recognized tests. Of the usual childhood illnesses, she had measles, chickenpox and whooping cough and, late in her fourth year, chorea. In spite of her bony malformations, she was always considered an active, vigorous child, at times emotionally unstable but not apparently because of any insight into her own physical or mental shortcomings. She was examined in the outpatient department of the Wrentham State School in October 1934, at which time she was 13 years and 5 months old chronologically and 3 years and 10 months mentally, which gave her an intelligence quotient of 0.33. This figure was not thought to be a criterion of her mental capabilities, since in many ways she appeared brighter than the tests indicated.

The child was admitted to the Wrentham State school in July 1935. Examination at that time revealed an obese, poorly developed, grossly malformed white girl of 14 years and 2 months, who was 130.1 cm. tall and weighed 48.1 Kg., the fatty tissue being most prominent about the lower part of the abdomen, the pelvic girdle and the thighs. The skin was generally pudgy, and cutis marmorata of the extremities and marked dermatographia were evident. The musculature—particularly the smaller muscles of the hands—was hypotonic. The skeletal framework showed many abnormalities: The left elbow was ankylosed; there was heteronatural mobility of the right elbow; the arm span was 122.5 cm., and both elbows flexed obtusely. The fingers were tapered and all showed heteronatural mobility due to hypotonic musculature and laxity of the ligaments.

The measurements of the fingers were as follows:

| | Right, Cm. | Left, Cm. |
|---|---|---|
| Index | 8.3 | 8.3 |
| 3d | 8.6 | 3.8 |
| 4th | 7.6 | 7.0 |
| 5th | 6.0 | 5.7 |

A small mass of soft tissue was found at the base of each little finger, on the ulnar aspect. A linear scar, which measured 5.08 cm., started at the base of the fourth finger and extended over the dorsum of the hand, and a linear

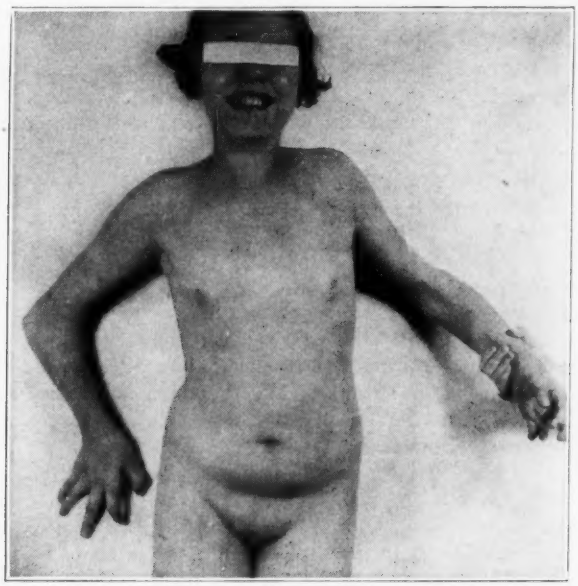

Fig. 1.—The patient on Jan. 18, 1937, at the age of 15 years.

scar 5.08 cm. long extended over the dorsum of the left hand from between the base of the third and that of the fourth finger. These scars represented the sites of the supernumerary digits previously operated on at another clinic (from which a summary of the case record had been obtained).

The lower extremities were grossly disproportioned. The measurements were as follows: thigh, to what appeared to be the anatomic knee, right 45.7 cm. and left 47.6 cm., and the leg from the knee to the internal malleolus, right 28.09 cm. and left 25.4 cm. The feet showed deformity of the valgus type and absence of both halluces. The second and the third toe were C-shaped, with the concavities facing each other. Both feet showed linear scars on the mesial aspect, extending from what anatomically would have been the base of the halluces to the mesial aspect of the feet. The legs were S-shaped, with the greatest bony prominence medially about 12.7 cm. below the knee and with a marked concavity just below the knee anteriorly. The circumference of

Fig. 2.—Photograph and roentgenogram of the patient's hands taken on Jan. 18, 1937.

Fig. 3.—Photograph and roentgenogram of the patient's legs taken on Jan. 18, 1937.

the left knee was 43.1 cm. and that of the right 40 cm. The greatest width of the right leg was 34.9 cm. and that of the left 38.1 cm.

The measurement on the right side from the sternoclavicular articulation to the anterior superior part of the ilium was 37.4 cm. and on the left side 39.3 cm. From the right anterior superior part of the ilium to the right internal malleolus was 72.3 cm.; the similar measurement on the left side was 69.8 cm.

The head was triangular, with some brachycephaly, and measured 53.3 cm. in circumference, 13.3 cm. in width and 16.9 cm. in length. The normal measurements are 53.5 cm., 14.5 cm. and 18.3 cm., respectively. The child had a high eccentric whorl to the left and enlarged frontal bosses. The face was ovoid and asymmetrical, with greater fulness on the right side, a deeper nasolabial fold on the left, slight depression and narrowing of the left palpebral rima, nasal brow and slight elevation of the right naris above the left. The eyes were blue, and the pupils were regular, equal and concentric and reacted well to light and in accommodation. There was no nystagmus or strabismus. The fundi were entirely normal. The ears were similar and simple in formation, with nonadherent lobules and no tubercles. No nasal obstruction or deviation was present. The mouth was held open. The left angle of the oral fissure drooped. There was moderate prognathism of the upper jaw. The teeth were malalined, maloccluded and carious. The tongue was fissured and deviated to the right on protrusion. The palate was high and of medium width. The tonsils were large and cryptic. A moderate amount of adenoid tissue was present. The neck was short and thick. The thyroid was palpable but was not considered to be enlarged. There was no enlargement of the lymph nodes. The chest showed lateral habitus and a widened costal angle. The nipples were infantile, and the breasts showed slight fulness.

The heart was not enlarged. The sounds were of fair quality, with reduplication of the first in the fourth interspace close to the left sternal margin and a systolic murmur originating in the pulmonic region and transmitted to the third left interspace and the second right interspace. The second pulmonic sound was clearer and more bell-like than the second aortic. The lungs were normal except for a few inconstant, moist râles in the base of the right lung laterally. The abdominal wall hung in redundant folds. The liver, spleen and kidneys were not palpable. The pubic hair was just beginning to show. The external genitalia were not malformed. The menses were not yet established. The deep tendon reflexes were sluggish. The urine gave an acid reaction, the specific gravity was 1.018 and albumin and sugar were absent. Microscopic examination showed numerous squamous epithelial cells and few leukocytes per high power field. The blood count showed hemoglobin 90 per cent, red blood cells 5,010,000 and white blood cells 8,050, with 75 per cent polymorphonuclears, 15 per cent large lymphocytes, 4 per cent small lymphocytes, 4 per cent eosinophils, 1 per cent transitional cells and 1 per cent basophils. The reaction to the Hinton test was negative. The basal metabolic rate was + 27 and + 18. The child was not very cooperative and was fairly apprehensive, and these readings were considered somewhat high.

When the mental examination was made (July 1935) the chronological age was 14 years and 2 months and the mental age was 4 years and 6 months. The intelligence quotient was 0.32. The psychologist at the school found the patient to be a sociable, friendly girl who chatted spontaneously and who made a limited effort although her comprehension was adjudged fair. She was easily distracted and drifted from one subject to another extraneous to the rest. Results of tests were somewhat irregular, with the base in the Binet standard for the age of 3

years. In the 4 year tests she could compare lines and discriminate forms and passed the comprehension questions. She seemed to have a fairly good idea of the square, but her drawings were poor. All the 5 year tests were passed except the comparison of weights and the naming of color. In the 6 year group she passed the test with mutilated pictures and the comprehension questions. The median of the six supplementary tests given her fell at 5 years, somewhat above her Binet rating. It was felt that the results in some of these were merely a matter of chance, even though her perception of form was relatively good. Because of her propensity to chatter, it was impossible to hold her attention. The individual scores in these tests were as follows: Knox cube imitation test, 3½ years; manikin test, 4½ years; Goddard form board test, 5 years; triangle test, 5 years; adaptation test, 5 years, and mare and foal test, 7½ years.

Roentgen examination showed that the vault of the skull was normal. The sella turcica was normal in size and outline. Both tibias were much shortened and markedly increased in width. Both fibulas were somewhat bowed, and their upper ends were high above the femoral condyle. Both great toes and their accessory tarsal bones were absent. A film which included the proximal portion of the left hand showed a spur on the third metacarpal bone.

The course of the child's development did not change materially after admission to the school. She had a few mild infections of the upper part of the respiratory tract and an attack, about one year after admission, simulating chorea. She responded well to rest in bed and salicylate therapy but continued to show marked emotional instability months afterward. At the time of writing the menstrual cycle has not been established.

SUMMARY

A case is presented in which the patient had about 70 per cent of the signs and characters belonging to the syndrome complex classified as the Laurence-Moon-Biedl syndrome. She had the typical adiposogenital dystrophia (the so-called Fröhlich syndrome), the mental deficiency, the skeletal abnormalities and the polydactylism. There was not, however, any familial incidence or changes in the eyes.

# ABSCESS OF THE LIVER IN A CHILD NINE MONTHS OF AGE

WILLIAM L. WOLFSON, M.D.
AND
ROBERT E. ROTHENBERG, M.D.
BROOKLYN

Pyogenic abscess of the liver occasionally occurs as a complication of intraperitoneal suppuration or, in rarer instances, as a result of a focus of infection elsewhere in the body. Ordinarily, the incidence of this lesion is particularly low for infants and young children.

In 1922 Cahill [1] reported a case of abscess of the liver in a child 4 years of age and also reviewed the literature on the subject. He collected seventy-two cases in children, which included examples of both the pyogenic and the amebic form of the disease. During the past few years there have been few contributors to the subject; but Bălăcesco and Popesco-Severin,[2] Friedlaender,[3] Fonzo,[4] Farago [5] and Ticozzi [6] have reported cases and mentioned previous reviews on the topic.

The case reported here is interesting because of the sequence of events which led to the formation of the abscess, the type of abscess which was found and the striking recovery which followed a simple operative procedure.

## REPORT OF A CASE

A boy 9 months of age was admitted to the hospital with a history of fever, marked irritability, refusal to take food and vomiting of three days' duration. The temperature was 102 F. The day after admission an indefinite mass was palpated in the lower right quadrant of the abdomen. A tentative diagnosis of abdominal abscess secondary to acute appendicitis was made, but it was thought better to await further localization of the inflammatory process than to operate immediately. On the ninth day of illness the mass was well developed and was readily palpable through the anterior abdominal wall.

The operation was performed through a low right rectus incision. An intraperitoneal abscess containing thick, foul-smelling pus was evacuated, and two drains were inserted into the infected area. Bacteriologic examination of the pus

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From the Surgical Service of the Jewish Hospital.

1. Cahill, J. A.: Internat. Clin. **4**:234-243, 1922.
2. Bălăcesco, I., and Popesco-Severin, A.: Bull. Soc. de pédiat. de Paris **30**:371-373 (May) 1932.
3. Friedlaender, A.: Acta pædiat. **6**:431-441, 1927.
4. Fonzo, F.: Lattante **5**:72-76 (Feb.) 1934.
5. Farago, E.: Orvosi hetil. **73**:704-706 (July 20) 1929.
6. Ticozzi, E.: Clin. pediat. **8**:547-564 (Sept.) 1926.

showed Bacillus coli and Staphylococcus albus. The postoperative reaction was satisfactory. The temperature subsided to a normal level on the fifth day. Seven days after the operation it was noticed that the umbilicus had become reddened, swollen and tender. An incision in the umbilicus was made on the ninth postoperative day, and 10 cc. of foul-smelling pus was obtained. Rapid recovery followed, and the child was sent home on the thirteenth postoperative day without drains and with healing wounds.

The child seemed well for twelve days, after which time his temperature again rose, ranging from 101 to 103 F. He became irritable, refused feedings and was found to have tenderness on the right side of the abdomen. Because the symptoms and signs of vague abdominal disorder continued for two weeks, the child was readmitted to the hospital. The blood count showed 28,000 white cells per cubic millimeter, with 74 per cent polymorphonuclear leukocytes. Examination of the urine gave normal results. A roentgenographic (flat plate) study of the abdomen revealed no abnormal findings. Examination showed a healed scar of the right rectus incision and a slightly reddened umbilicus. It was necessary to administer a general anesthetic to make a satisfactory abdominal examination. A definite fulness and what was believed to be a mass were felt in the upper right quadrant of the abdomen. A diagnosis of subhepatic abscess was made.

A laparotomy was performed through an oblique infracostal incision on the right side. The liver was enlarged to about 2 fingerbreadths below the costal margin, and there was a bulging soft area about 3 cm. in diameter within its substance on the inferior surface of the right lobe. The hepatic capsule and tissue directly over this mass appeared darker than normal. Aspiration (by a syringe and needle) of the soft area at a depth of about 2 cm. yielded 12 cc. of thick yellow pus. Since the abscess was deep in the substance of the liver and there were insufficient adhesions to wall off the infected area from the general peritoneal cavity, it was deemed advisable to pack and quarantine this region and to incise the abscess at a later date if necessary. Four gauze drains were placed about the surface of the liver in the region of the abscess. Although cultures of the pus were sterile, the direct smears showed gram-positive cocci and gram-negative and gram-positive bacilli.

The postoperative course was surprisingly uneventful. On the third day after the operation a small amount of purulent discharge was found on the dressings. After some deliberation it was considered unnecessary to perform a second operation for incision of the abscess, since the temperature had remained normal after the fourth day and the child appeared well. Fifteen days after the operation the patient was discharged with a healing wound.

On two occasions after the child left the hospital, abscesses developed at the site of the right rectus incision. These abscesses were well localized and opened spontaneously through the scar. It was the opinion that they represented recurrent attacks of acute appendicitis with the formation of an abscess, followed by rupture, although they might have been localized abscesses originating in the abdominal wall. When the child was last seen, in December 1936, ten months after the onset of the illness, the wounds were well healed and he was free from abdominal disturbance and in good general health.

## COMMENT

Several interesting features make this case unusual. It is difficult to decide which of the two primary infections, i. e., the appendical abscess or the umbilical abscess, was responsible for the formation of the

abscess in the liver, as there are a number of routes along which the infection could have traveled. One possibility is that the infection extended from the region of the appendical abscess to the umbilicus

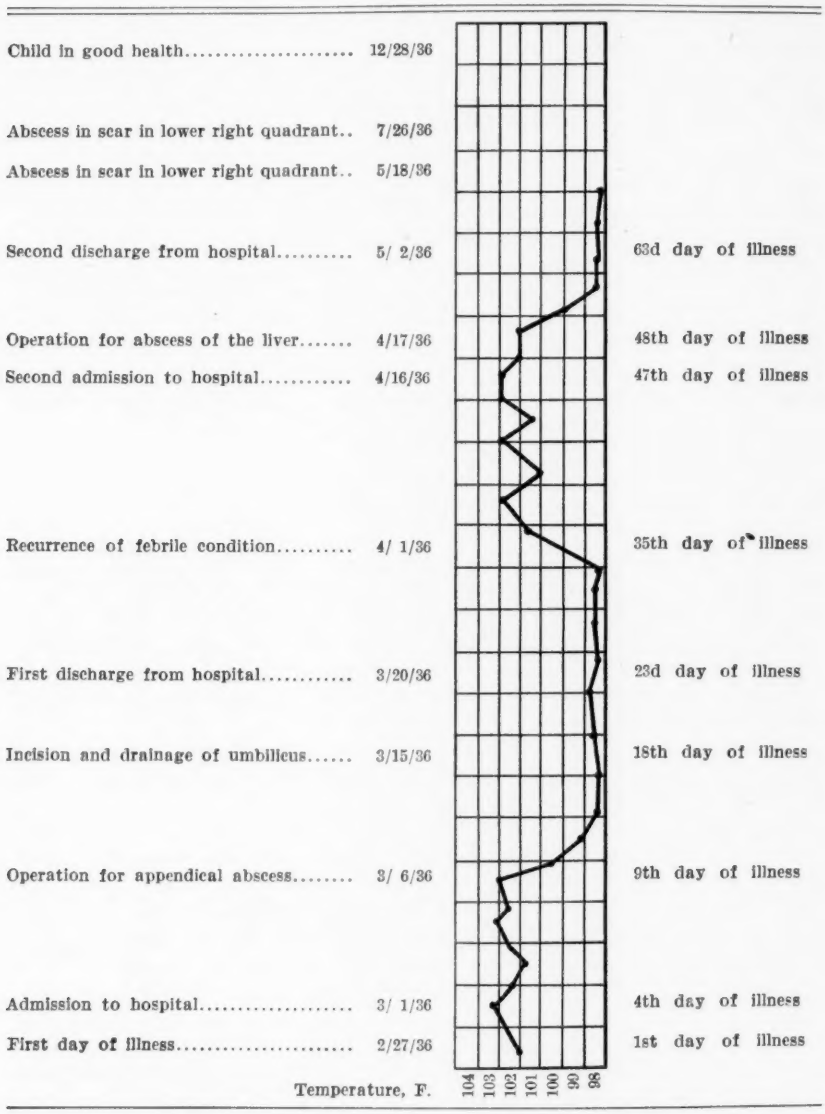
Child in good health..... 12/28/36
Abscess in scar in lower right quadrant.. 7/26/36
Abscess in scar in lower right quadrant.. 5/18/36
Second discharge from hospital..... 5/ 2/36
63d day of illness
Operation for abscess of the liver..... 4/17/36
48th day of illness
Second admission to hospital..... 4/16/36
47th day of illness
Recurrence of febrile condition..... 4/ 1/36
35th day of illness
First discharge from hospital..... 3/20/36
23d day of illness
Incision and drainage of umbilicus..... 3/15/36
18th day of illness
Operation for appendical abscess..... 3/ 6/36
9th day of illness
Admission to hospital..... 3/ 1/36
4th day of illness
First day of illness..... 2/27/36
1st day of illness
Temperature, F.
104
103
102
101
100
99
98

Chart showing the course of the patient's illness

through the abdominal wall, to produce suppurative omphalitis. It could then be borne to the liver by way of the small veins which accompany the round ligament and empty into the portal vein near the portal fissure.

This explanation is more acceptable than the hypothesis that the infection migrated directly from an involved appendical vein (thrombophlebitis) to the portal vein, because diffusion by the latter route almost always results in widespread pylephlebitis with the formation of multiple abscesses of the liver. Also, direct infection from the appendical veins to the portal system usually gives earlier, sudden and more disturbing clinical evidence than was noted in this case (chart). Thirty days elapsed between the appearance of the appendical abscess and the development of the symptoms and signs of the hepatic abscess; during this time no chills, sweats or jaundice were noted. Still another possibility is that the infection from the appendical area reached the liver through the main portal system and that from there a retrograde infection of the umbilicus took place via the small umbilical veins or lymphatics in the round ligament.

This case is unusual in that a single abscess of the liver was found, for when infection arises either from the appendix or from the umbilicus multiple abscesses are almost always encountered if extension takes place into the liver.

An additional item of interest is the rapid and satisfactory recovery that followed a single aspiration of a hepatic abscess of pyogenic origin. Ordinarily, it is necessary to perform a second stage operation, in which the abdominal wound is opened and the abscess is incised with cautery or scalpel. Although aspiration without incision is frequently employed as a standard treatment for amebic abscess of the liver, it is seldom used as the complete procedure for pyogenic abscess.

The satisfactory result in this instance is significant. It indicates that it is possible, in young children at least, to empty a hepatic abscess of its liquid content by aspiration and to permit what is left of the suppurative process to be absorbed or to be discharged through the puncture sinus to the surface of the liver and to escape along the drains to the skin.

SUMMARY

A single pyogenic abscess of the liver in a child 9 months of age, secondary to appendical abscess or suppurative omphalitis, with recovery following laparotomy and aspiration of the hepatic abscess is reported.

564 Ocean Avenue.

175 Eastern Parkway.

# Progress in Pediatrics

## PULMONARY PATHOLOGIC CONDITIONS IN INFANCY AND IN CHILDHOOD

### A CLINICAL SURVEY FROM THE BRONCHOSCOPIC POINT OF VIEW

V. K. HART, M.D.
CHARLOTTE, N. C.

Much has been written on the recognition and the management of foreign bodies in the respiratory tract in children and the attendant infections. Time and space do not permit individual references to the many publications of Jackson, Clerf and Tucker on this subject. The experiences of my co-workers and me over a ten year period have been described in a paper in which we analyzed a large series of consecutive cases of foreign bodies in the food and the air passages.[1] A second communication dealt with oxygen therapy in the postbronchoscopic care of children following the extraction of foreign bodies.[2] Hence, in the present paper I shall not deal with foreign bodies per se.

Pulmonary suppuration has also had a voluminous literature since the advent of bronchoscopy. It is believed, nevertheless, that a presentation solely from the pediatric aspect will lack neither in clinical nor in therapeutic interest.

The presentation of this subject is intended to be practical. Such practicality is the proper forte for physicians engaged in an active clinical practice. In this every-day practice one constantly sees children with various types of pulmonary disease. Only in recent years has a clearer understanding of this kind of disease been achieved, largely because of better roentgenologic technic and bronchoscopic study. Concomitantly, it is realized that all the problems are not solved.

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From the Charlotte Eye, Ear and Throat Hospital.

Read before the Eye, Ear, Nose and Throat Section of the South Carolina State Medical Society at Columbia, S. C., on Oct. 17, 1933; before the North Carolina Pediatric Society at Charlotte, N. C., on May 23, 1934, and before the general session of the North Carolina State Medical Society at Pinehurst, N. C., on May 8, 1935.

1. Hart, V. K.; Peeler, C. N., and Motley, F. E.: A Review of Ten Years' Experience with Foreign Bodies of the Throat, Lungs, and Esophagus, South. Med. & Surg. **94**:137 (March) 1932.

2. Hart, V. K., and Davis, S. W.: Oxygen Tent in Postbronchoscopic Care of Children, Arch. Otolaryng. **16**:526 (Oct.) 1932.

These two points of view will be illustrated by the subsequent clinical data. Laboratory findings will be mentioned only when pertinent. All bronchoscopies not otherwise specified were done without anesthesia.

The appended reports of clinical cases are presented in sequence under the following captions: (1) congenital defects, (2) primary bronchial diphtheria, (3) suppurative pneumonitis, acute or chronic (cavitation is included as a later stage of pneumonitis; the preliminary pneumonitis may be of long or short duration [3]) and (4) bronchiectasis secondary to a neglected foreign body.

## CONGENITAL DEFECTS

The most common type is the congenital tracheo-esophageal fistula. In the last ten years my co-workers and I have had 3 cases of this condition at the Eye, Ear and Throat Hospital. All the infants were examined post mortem, and the defect proved to be of the same type, viz., a blind upper esophageal segment and a lower segment connecting directly with the trachea. Therefore, when palliative gastrostomy was done, the baby coughed up milk. (Since this paper was written, we have had 2 other cases, in which the diagnosis was proved endoscopically but autopsy was not performed.)

There is inability to retain milk from the onset of nursing. Esophagoscopy during life discloses the imperforate esophagus and establishes the diagnosis.

Since there are a number of cases on record, including 1 of my own,[4] I do not here report a case in detail. Other types of congenital anomaly of the esophagus have also been reported.

We have never seen in our clinic a congenital air cyst of the lung. This condition must be rare, as Croswell and King [5] were able to find only 121 cases, including 1 of their own. Their patient recovered after repeated aspirations of air by transpleural puncture. The infant usually dies.

One case of congenital stenosis of the bronchi to the upper lobe of the left lung (fig. 2) has been reported by Phillips and Peeler.[6] Dr. Peeler, an associate, was not able to get a 4 mm. bronchoscope through the larynx without undue trauma. (This was before the advent of the 3.5 and 3 mm. bronchoscopes now available.) When the patient was

3. Jackson, C., and Jackson, C. L.: Bronchoscopic Observations on Postoperative Pulmonary Complications, Ann. Surg. **97**:516 (April) 1933.

4. Hart, V. K.: Congenital Tracheoesophageal Fistula, South. M. J. **24**:762 (Sept.) 1931.

5. Croswell, C. V., and King, J. C.: Congenital Air Cyst of the Lung: Report of a Case, J. A. M. A. **101**:832 (Sept. 9) 1933.

6. Peeler, C. N., and Phillips, C. C.: Some Observations on Endoscopy: Report of Four Different Cases, South. Med. & Surg. **84**:299 (June) 1922.

2 months of age he was seen because of dyspnea and cyanosis. He died at the age of 3 months. Autopsy disclosed marked stenosis of the bronchi to the upper lobe of the left lung, with ball valve action such that an ingress of air was possible, but no egress. Therefore, there was marked emphysema of this lobe, with displacement of the heart and the mediastinal structures to the right. These abnormalities greatly embarrassed the normal right lung, and death eventually resulted. The

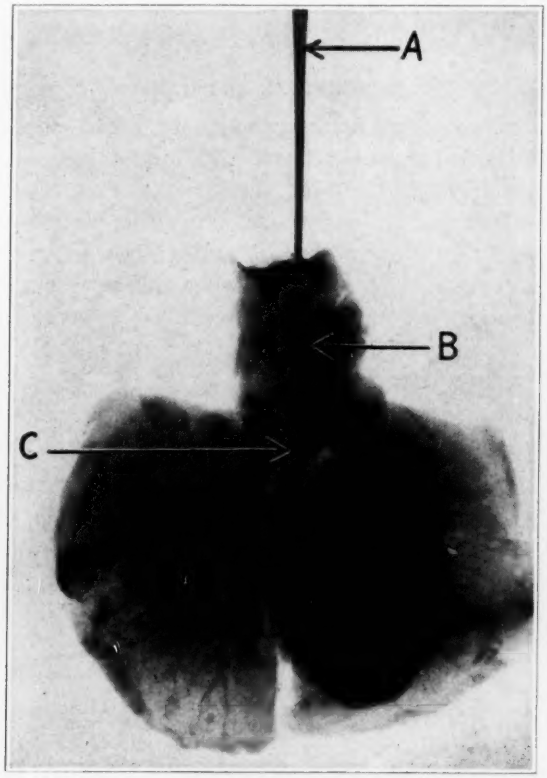


Fig. 1.—Roentgenogram of a specimen studied at autopsy. The lungs have been injected with iodized poppy-seed oil. *A* indicates a probe extending through the larynx and the trachea to the bifurcation; *B*, a blind pouch in the upper esophageal segment injected with a preparation of barium, and *C*, the lower esophageal segment injected with a preparation of barium and connecting with the trachea.

lower lobe of the left lung was atelectatic owing to the distention of the upper lobe.

### PRIMARY BRONCHIAL DIPHTHERIA

Fortunately this malady is uncommon. More frequent, however, is primary tracheobronchial diphtheria.

Since, with Peeler, I [7] have previously reported a case of primary bronchial diphtheria, I pause here only to emphasize certain cardinal points. In any case of dyspnea, endoscopic examination with direct visualization of the affected part and the taking of direct smears and material for culture is important. Proper therapy can only thus be instituted early.

The therapy to be employed other than the prompt administration of antitoxin is bronchoscopy as it seems necessary. Since our previous report with postmortem observations, we have observed 1 child, aged 2

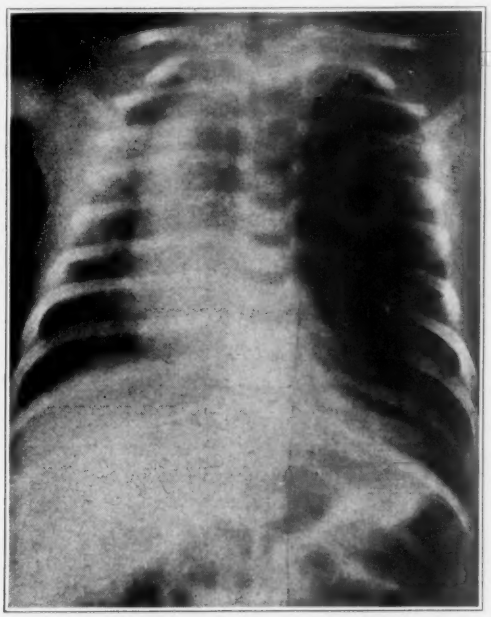

Fig. 2.—Congenital stenosis of the bronchus to the upper lobe of the left lung in a 2 month old baby. There is marked emphysema (trapped air) in this lobe, displacing the heart and the mediastinal structures to the right. The lower lobe of the left lung was shown at autopsy to be atelectatic. (This roentgenogram was provided by Dr. C. C. Phillips, of the New Charlotte Sanatorium.)

years, with tracheobronchial diphtheria, who recovered after five emergency bronchoscopic removals of membrane from both main bronchi, each preceded by complete collapse. The operating room was kept ready night and day. Tracheotomy had been done previously. Six years has elapsed, and the child has remained well.

7. Hart, V. K., and Peeler, C. N.: Primary Tracheobronchial Dipththeria, Arch. Otolaryng. **13**:714 (May) 1931.

This type of infection causes an expiratory (asthmatic) type of dyspnea, in contradistinction to the inspiratory dyspnea of laryngeal and tracheal obstruction. Expiratory dyspnea should always suggest bronchial obstruction and is a clearcut indication for bronchoscopy.[8] Emphysema with relative clinical findings is present.

### SUPPURATIVE PNEUMONITIS, ACUTE OR CHRONIC

The phrase should be used in a strict sense, to indicate an area of increased density on a roentgenogram that corresponds clinically to an infiltrated, exudative area of pathologic change which has progressed to the stage of the formation of pus. Obstructive atelectatic conditions are first considered. In them one has, of course, secondary pneumonitis.

Hence, viscid secretion is apparently a frequent etiologic factor.[9] Attention is also called to the fact that the atelectasis may be lobar or lobular. In such cases there may be no displacement of the heart like that in massive atelectasis with obstruction of the main stem bronchus. One should not overlook basal triangular shadows as showing possible atelectatic areas. Singer and Graham[10] and later Anspach[11] stressed this fact. Anspach emphasized such pathologic change in children as a forerunner of bronchiectasis if not relieved by drainage.

CASE 1.—*Postoperative obstructive atelectasis.*

A white girl aged 7 years was sent to the clinic on Sept. 11, 1932, because of cough and periodic dyspnea, which symptoms had supervened after a tonsillectomy performed two months previously. She had surprisingly little afternoon fever. A roentgenogram showed obstructive atelectasis of the lower lobe of the right lung. This cleared completely shortly after one bronchoscopic aspiration with a no. 5 bronchoscope of a small amount of pus from the bronchus of the lower lobe. Whether the condition began from retained viscid secretion, from aspirated blood, with the formation of a clot, or from aspirated vomitus is of only academic interest.

CASE 2.—*Obstructive atelectasis complicating pneumonia.*

This patient had a most unusual course clinically, and the record is abstracted in some detail. While bronchoscopy was not the only factor in her ultimate

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8. Tucker, Gabriel: Obstructive Dyspnea: Bronchoscopic Observations; Types, with Illustrative Cases, South. M. J. **25**:723 (July) 1932.

9. Eliason, E. L., and McLaughlin, C. W., Jr.: Postoperative Pulmonary Atelectasis, S. Clin. North America **14**:1 (Feb.) 1934. Tucker, Gabriel: Bronchoscopic Observations on Obstructive Pulmonary Atelectasis, Arch. Otolaryng. **13**:315 (March) 1931. Hearn, W. P., and Clerf, Louis H.: Postoperative Massive Collapse of the Lung, Ann. Surg. **85**:54 (Jan.) 1927.

10. Singer, J. J., and Graham, E. A.: Roentgen Ray Study of Bronchiectasis, Am. J. Roentgenol. **15**:54 (Jan.) 1926.

11. Anspach, W. E.: Atelectasis and Bronchiectasis in Children, Am. J. Dis. Child. **47**:1011 (May) 1934.

recovery, it played an important part. Coryllos and Birnbaum[12] have done a great deal of experimental and clinical work on this problem. They have emphasized the condition as a true entity in connection with the thick viscid pus characteristic of the pneumococcus.

A white girl aged 2 years was first seen at the Presbyterian Hospital on May 12, 1933, by Dr. John Ashe, pediatrician. At that time she had facial paralysis of the right side complicating frank acute otitis media of the right side, for which immediate paracentesis was done. There was also some clinical evidence of bronchopneumonia. Because facial paralysis, particularly in a child, may result from a simple infection of the middle ear, antrotomy was deferred. When the temperature rose and the toxemia increased out of proportion to the pulmonary signs, on May 20, 1933, antrotomy was done rapidly under local anesthesia. On May 26 the breath sounds were markedly diminished over the whole lower left part of the chest, and a roentgenogram showed evidence of beginning obstructive atelectasis. Bronchoscopy was advised and done, a special 3.5 mm. bronchoscope

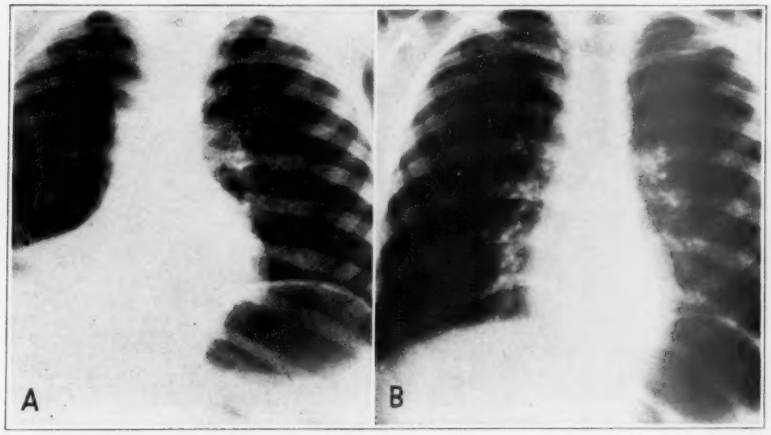


Fig. 3 (case 1).—*A*, obstructive atelectasis of the lower lobe of the right lung of a 7 year old girl. The condition developed two months after tonsillectomy. *B*, a roentgenogram taken shortly after a bronchoscopic aspiration of pus from the lower part of the right bronchus. No further treatment was necessary.

being used. (This small size plus a short working time, of from three to four minutes, averted any postbronchoscopic laryngeal edema.) Foul-smelling viscid pus was aspirated from the left main stem bronchus. Two cubic centimeters of monoparachlorophenol was instilled. The bronchoscopic specimen contained no tubercle bacilli. Bronchoscopies, with the same technic, were carried out as often as every other day. The response of the temperature was favorable. In all, eleven bronchoscopies were done.

Transfusions were done by Dr. Ashe on May 23, May 26 and June 17. Though the blood sugar content during fasting was only 90.1 mg. per hundred cubic centi-

12. Coryllos, P. N., and Birnbaum, G. L.: Syndrome of Pneumococcic Bronchial Obstruction: Experimental Production of Atelectasis or Lobar Pneumonia with Human Pneumonic Sputum; Suggestion for Preventive and Therapeutic Treatment, Arch. Int. Med. **51**:290 (Feb.) 1933.

meters, Dr. Ashe started the administration of dextrose subcutaneously and of insulin intramuscularly on June 23 because of an apparent marked lack of resistance as shown by almost total lack of healing in the mastoid wound and repeated flare-ups of the pathologic condition in the chest.

The administration of these substances was discontinued on June 30. The response had been most satisfactory. The wound began to heal, vomiting ceased

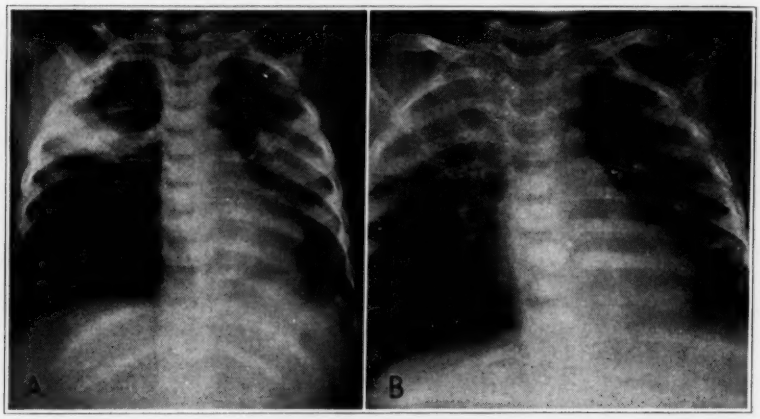


Fig. 4 (case 2).—The lungs of a 2 year old girl with beginning obstructive atelectasis complicating pneumonia. Note the displacement of the heart to the left. Thick pus was aspirated from the left bronchus. *B*, the result after bronchoscopic treatment. The heart has returned to the normal position.

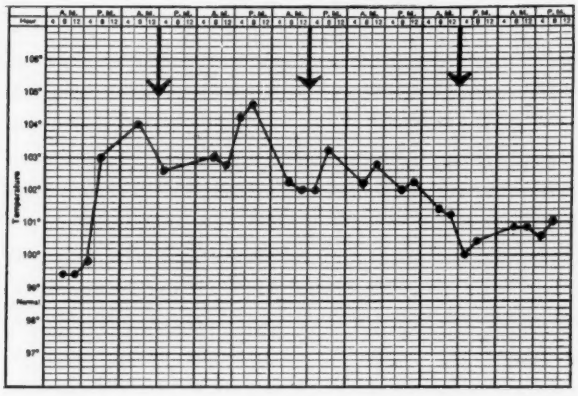

Fig. 5 (case 2).—Temperature chart purposely made at a time when no major therapy except the aspiration of pus by bronchoscope was being done. The arrows indicate bronchoscopic treatments.

and the general clinical picture improved greatly. The child went on to complete recovery, and the facial paralysis cleared. She has remained well since.

The Wassermann reaction of the blood was negative. The child had mild secondary anemia, and the white count varied from 18,000 to 25,000. The urine showed at one time 25 pus cells to the low power field.

CASE 3.—*Unresolved pneumonia.*

This condition probably also represents a type of atelectasis due to a thick viscid secretion which can be demonstrated bronchoscopically. Just when the atelectasis begins cannot be stated, as the patient is usually not seen until six or eight weeks after the acute stage. According to our experience this type of condition is more frequently observed than the atelectasis of acute pneumonia.

The patient presented several interesting features. He was a white child aged 7 years and was admitted to the hospital on Jan. 18, 1936. His roentgenogram showed a more or less homogeneous increase of density in the left side of the chest from the second to the fifth rib anteriorly. The left costophrenic angle was clear. The roentgenogram was interpreted as indicating obstructive atelectasis of the upper lobe of the left lung. There was also slight displacement of the heart to the right, suggesting disease of the left pleural cavity rather than obstructive atelectasis. Nevertheless, previous pleural puncture and fluoroscopic study had failed to demonstrate such a condition.

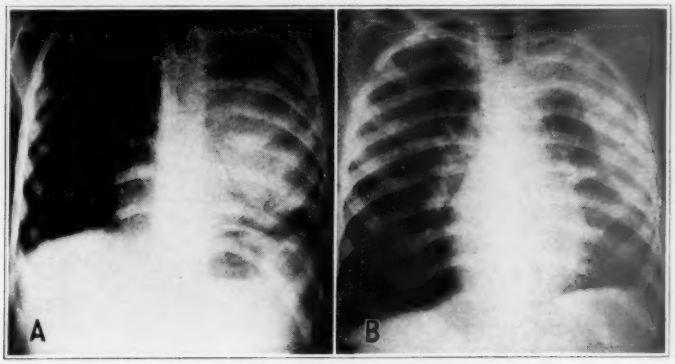


Fig. 6 (case 3).—*A*, the lungs of a white boy aged 7 years, six weeks after an attack of pneumonia. More or less homogeneous density is shown on the left from the second to the fifth rib anteriorly. There is also some displacement of the heart to the right. Nevertheless, pleural taps had given negative results. The condition was probably a type of lobar or lobular atelectasis. *B*, roentgenogram of the chest taken because of a recrudescence of fever after apparent recovery. A pleural shadow is visible high up and anterior to the left scapula. Fluid was aspirated from this area by pleural puncture, and complete recovery followed. The condition in the left pleural cavity probably accounted for the cardiac shift shown in *A*.

The boy had been ill for six weeks. The onset was acute pneumonia, from which he had never entirely recovered. There were a productive cough and intermittent fever. The child was pale, listless and irritable. Marked secondary anemia was present (hemoglobin, 55 per cent), and there was no leukocytosis. The differential count was normal.

Bronchoscopy was done after the injection of 1/12 grain (0.005 Gm.) of morphine. A no. 5 bronchoscope was passed. There was nothing unusual on the right side. From the left main stem bronchus, thick viscid secretion was aspirated. Apparently this was coming from the divisions in both the upper and the lower

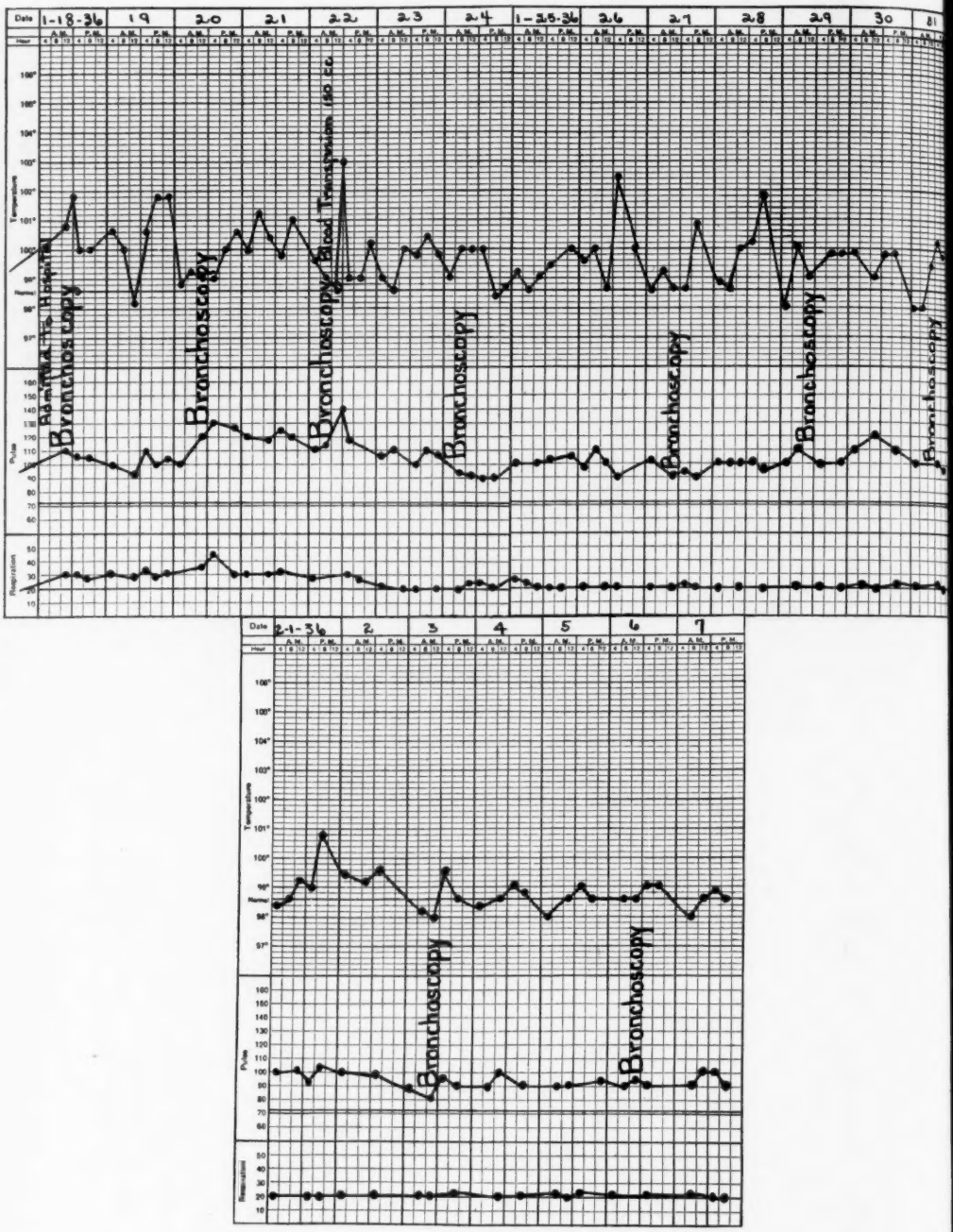


Fig. 7 (case 3).—Temperature chart showing the response to repeated bronchoscopic aspirations of thick pus largely from the upper lobe of the left lung.

lobe. The flow from the lower lobe may have been secondary to the gravitation of pus from the upper lobe. This statement is made because subsequent bronchoscopies showed the pus to be largely from the upper lobe.

The bacteriologic report of a bronchoscopic specimen of pus was as follows: Gram stain: streptococci, staphylococci and pneumococci: Ziehl-Neelsen stain: no tubercle bacilli; culture: a mixed growth of pneumococci, streptococci, gram-negative cocci and gram-negative bacilli; pneumococci, type I.

During the next month ten bronchoscopic aspirations were done. The child was given one transfusion of 150 cc. of blood by the indirect method on January 22. Under this management, the temperature curve flattened to normal. He was discharged on February 8.

He returned on February 17 with the history of having had a recurrence of fever, with a temperature of from 102 to 104 F. (by mouth), for the previous three days. Bronchoscopy showed essentially no pus. A roentgenogram of the chest was then made, and it revealed a definite circumscribed shadow anterior to the scapula on the left. The surgical consultant did a pleural tap high up toward the axilla and removed a large amount of brownish fluid. After this the child went on to complete recovery, and he has remained well since. No further aspiration or rib resection was necessary.

The original displacement of the heart to the opposite side, then, is probably explained by the pleural disease. It had probably coexisted with the pulmonary suppuration. It is hardly reasonable to assume that it developed after the recovery of the lung. The advantage of taking another roentgenogram after several bronchoscopic aspirations have been done is evident.

CASE 4.—*Diffuse, acute purulent bronchitis with secondary basal atelectasis.*

A boy aged 9 years was admitted to the hospital on June 16, 1934, because of fever and a productive cough. A year previously he had had a somewhat similar attack after measles. He had been well until three weeks previously. The temperature on admission was 104 F. (by mouth). The referring physician thought he had bronchiectasis. A roentgenogram did show bilateral shadows of the cardiophrenic angles. Examination of the ear, nose and throat revealed nothing abnormal.

Bronchoscopy was done on the day of admission with a no. 6 bronchoscope. A quantity of tenacious pus was aspirated from both main bronchi. (It would not run down the sides of an inverted specimen collector.) Pus was seen spouting from the bronchi of both the upper and the lower lobe on both sides. The bronchial mucosa was diffusely reddened and swollen. Five cubic centimeters of cajuput oil was instilled.

The laboratory reported a pure culture of a small gram-negative coccus (catarrhalis group). A dark field examination showed no fusiform bacilli or spirochetes. Culture on Sabouraud's medium was negative. No tubercle bacilli were observed.

The child was sent home shortly thereafter and was then treated as an outpatient. Eight subsequent bronchoscopies with the instillation of oil were done at intervals of four or five days. The temperature promptly came down by lysis, and the child has remained well since. Lung mapping after recovery showed no bronchiectasis. This type of condition neglected, however, might easily develop into bronchiectasis. Clerf[13] has emphasized this prophylactic treatment particularly following measles. Any residual sinus infection must also be treated.

13. Clerf, Louis H.: Bronchiectasis Associated with Disease of the Nasal Accessory Sinus: Etiology and Bronchoscopic Treatment, Arch. Otolaryng. **6**:28 (July) 1927.

CASE 5.—*Atelectasis, the onset dating to some acute infection of the respiratory tract.*

This case is one of the most interesting in our series. The patient was a white girl aged 3 years, first seen on March 13, 1933. A roentgenogram showed massive density of the whole lower lobe of the left lung. There was no history of aspiration of a foreign body. The symptoms came on with gradually increasing

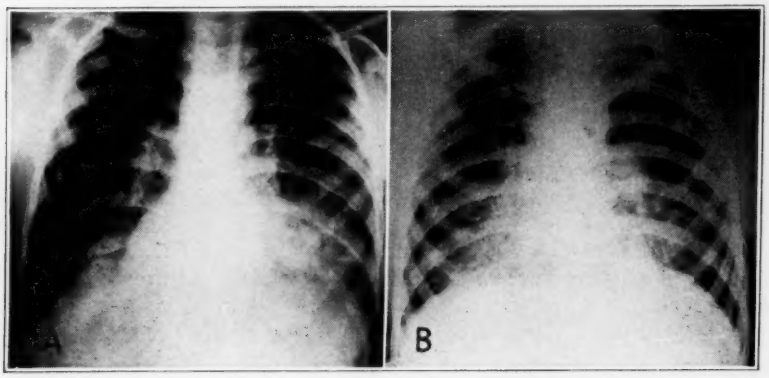


Fig. 8 (case 4).—*A,* roentgenogram showing basal triangular shadows in both cardiophrenic angles. Such shadows probably represent atelectatic areas, as was emphasized by Singer and Graham and later by Anspach. The patient was a 9 year old boy with acute, diffuse, purulent bronchitis. *B,* roentgenogram taken after bronchoscopic treatment. The basal atelectatic areas have cleared. Ten cubic centimeters of lipoiodine has been instilled in each side through a bronchoscope. No bronchiectasis is shown. This emphasizes the importance of prophylactic care.

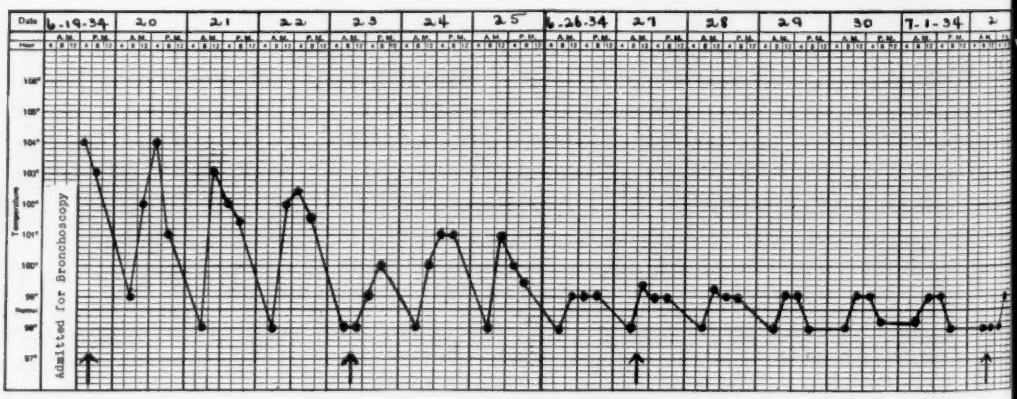


Fig. 9 (case 4).—Temperature chart showing the response to bronchoscopic aspiration. The arrows indicate bronchoscopic treatments.

severity after a supposed attack of whooping cough. For the past few months the child had had persistent productive cough, malaise, afternoon temperature and recurrent vomiting.

She was obviously a very sick child and was at once hospitalized. No sinus infection was clinically present. She had chronically diseased tonsils and adenoids. There were marked diminution of breath sounds and flatness over all of the left lower part of the chest.

An overlooked foreign body was suspected, and a bronchoscopy was done with a no. 4 bronchoscope. No foreign body was found, but a quantity of foul pus was suctioned from the bronchus of the lower lobe of the left lung. This process was repeated in six days with a no. 4 bronchoscope, and a foreign body was again carefully excluded. However, there was some laryngeal reaction from both procedures. The use of a 3.5 mm. bronchoscope purely for purposes of aspiration was then begun, and the bronchoscopy was followed by instillation of 2 cc. of monoparachlorophenol. The working time was restricted to three or four minutes.

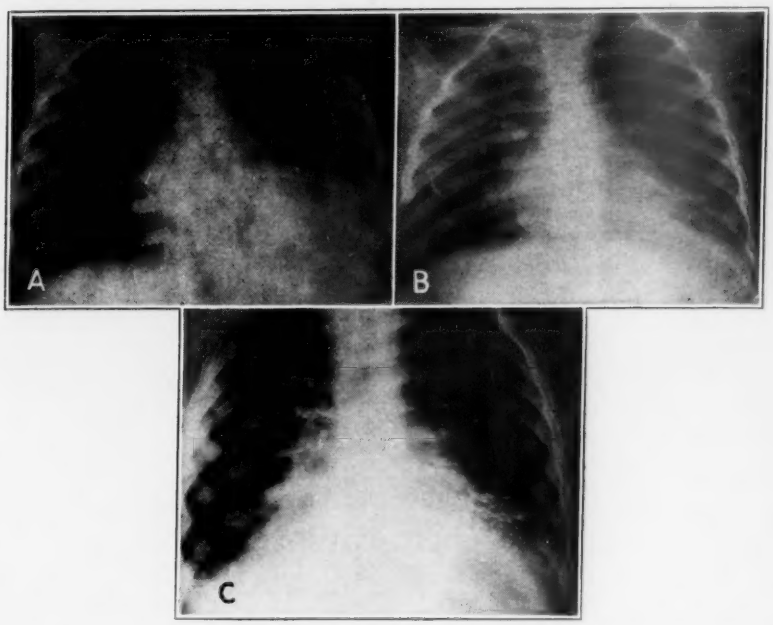


Fig. 10 (case 5).—*A*, roentgenogram of the lungs of a 3 year old girl, showing what was probably atelectasis of the base of the left lung. The only antecedent factor known was whooping cough. *B*, the end-result of repeated bronchoscopic aspirations. *C*, the lungs after an injection of lipoiodine into the left bronchus through a bronchoscope. This injection was done because there was still slight elevation of the afternoon temperature and a small amount of pus coming from the lower part of the left bronchus despite fifty bronchoscopic treatments. No bronchiectasis is shown. This residual pathologic process was finally controlled by pneumothorax, and the child recovered.

With this technic there was no reaction, and bronchoscopy could be carried out every two or three days. An afternoon temperature of from 104 to 105 F. (rectal) began to decline steadily. Vomiting ceased. At the end of four weeks the child was discharged from the hospital, though she still had an afternoon temperature of from 99 to 100 F. (rectal).

Laboratory examination of a bronchoscopic specimen of pus showed no spirochetes on dark field examination and no tubercle bacilli. Culture showed gram-negative diplococci, a few pneumococci, and streptococci. The blood count showed typical secondary anemia with 25,000 white cells and 60 per cent polymorphonuclears.

The child was then treated as an outpatient and had two bronchoscopies weekly. After fifty bronchoscopies, a stalemate was reached. The lung had cleared roentgenologically. Five cubic centimeters of lipoiodine instilled into the left bronchus failed to show any bronchiectasis. Still, at each bronchoscopy probably an ounce (30 cc.) of pus was suctioned from the tracheobronchial tree, always largely from the left side. The child continued to have a slight afternoon fever.

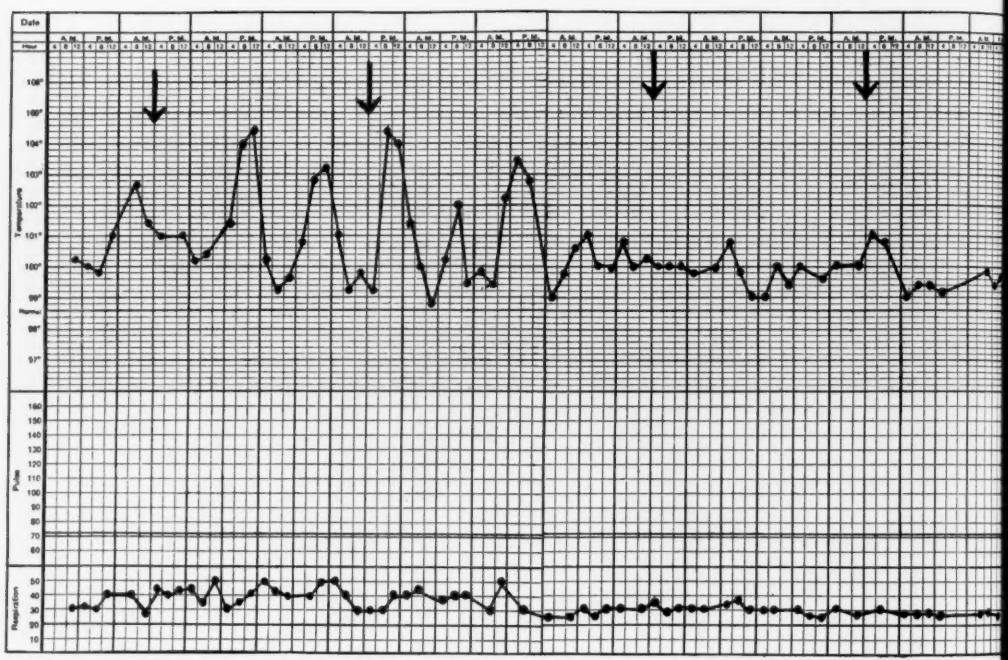


Fig. 11 (case 5).—Temperature chart showing the response to bronchoscopic treatments, which are indicated by arrows.

At this stage we sought surgical consultation and asked Dr. Thomas Sparrow to see her. He advised a phrenic exeresis on the left side, which was done with local anesthesia. There were no untoward symptoms, and subsequent bronchoscopies showed a definite reduction in the amount of pus.

After sixty-five bronchoscopies we had again reached somewhat of a stalemate. There was still a small amount of residual thick pus, and an occasional slight elevation of the afternoon temperature was noted. At this stage we sought the aid of the surgeon once more. Dr. Sparrow introduced approximately 100 cc. of air into the left pleural cavity, with no ill effects, on Dec. 18, 1933, and on Jan. 1, 8 and 14, 1934. During this period no bronchoscopies were done.

The final bronchoscopy was done on March 20, 1934. For the first time there was no pus and the bronchial tree on the left was entirely normal. A roentgenogram showed that the left lung had completely reexpanded and that the left side of the diaphragm was high owing to the previous phrenic operation. The lung fields were altogether normal. The temperature had been normal for several weeks. The child was therefore discharged as cured. She has remained well.

CASE 6.—*Obstructive atelectasis due to bronchial compression by tuberculous peribronchial glands.*

A white boy aged 7 months was referred to us on Jan. 10, 1931, with a diagnosis that a foreign body was present. The roentgenogram was certainly suggestive of this diagnosis, as there was marked obstructive atelectasis of the left lung, with the heart displaced to the left and secondary "drowned lung." There were a marked decrease of breath sounds over all the left side of the chest and a fluctuating temperature. The white cell count was 28,800, with polymorphonuclears 38 per cent, lymphocytes 44 per cent, large mononuclears 14 per cent and transitional forms 4 per cent.

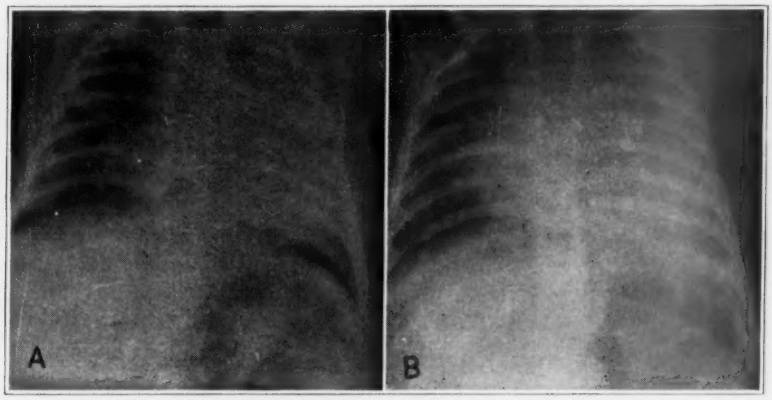


Fig. 12 (case 6).—*A*, a roentgenogram indicating obstructive atelectasis of the left lung in a 7 month old baby. Bronchoscopy showed only compression of the left bronchus with secondary infection. *B*, taken after bronchoscopic aspiration, shows some improvement. The end-result, however, was death. The obstruction probably originated in tuberculous peribronchial glands, as the mother died two years later of proved tuberculosis.

Bronchoscopy with a no. 4 bronchoscope showed only a swollen, obstructed bronchus, from which some pus was aspirated. No foreign body was demonstrated. Having had a previous experience with primary bronchial diphtheria, we took a direct culture for Klebs-Löffler bacilli. None were observed. A bronchoscopic specimen of pus contained no tubercle bacilli. The predominating organism was of the streptococcus group. The right bronchus was normal.

There was considerable clearing of the lung after bronchoscopy, with corresponding clinical improvement. However, because of the distinctly unilateral involvement, we felt that the condition was primarily obstructive, with infection as a secondary factor. Suspecting tuberculous peribronchial and mediastinal glands

with secondary compression, we asked for a tuberculin test. Much to our surprise the reaction was reported as negative. Three pleural taps by our pediatric consultant yielded nothing.

During the next three months this child had recurring cycles of obstructive atelectasis in the left lung. Four subsequent bronchoscopies were done. No foreign body was ever demonstrated. At the last bronchoscopic examination, on April 15, 1931, both tracheal and left bronchial compression could be definitely demonstrated. The child died shortly thereafter at the home of the parents, and no autopsy was performed.

Two years later the mother of the child died in a county tuberculosis sanatorium; both lungs were riddled with tuberculosis, as shown by roentgenograms, and the sputum had contained tubercle bacilli. Consequently, despite the negative reaction to the tuberculin test, one must view the obstruction in the son's case as due to compression by tuberculous glands. The pulmonary infection secondary to the obstruction accounted for the leukocytosis.

Other types of suppurative pneumonitis which are not primarily obstructive will now be considered.

CASE 7.—*Direct extension of tuberculous mediastinitis to the parenchyma of the lung.*

Although the patient, a white girl aged 14 years, was not seen by us until on March 8, 1933, Dr. P. P. McCain, of the North Carolina Tuberculosis Sanatorium, who referred her, provided a complete clinical and roentgenographic record extending back eight years. She had a positive reaction to an intradermal tuberculin test (plus four with 0.001 mg.) with a bad family history. She had a history of intermittent cough, loss of weight and periodic fever. Repeated examinations of the sputum had not revealed tubercle bacilli.

When we saw her a roentgenogram showed a marked circumscribed area of increased density in juxtaposition to the mediastinum on the right side and apparently invading the upper lobe of the lung. This area was sharply circumscribed.

Bronchoscopy at this time under local anesthesia showed some displacement inward of the right tracheal wall and marked fixation and compression of the right main stem bronchus; the left side was normal. Pus was encountered in the right main bronchus and was aspirated for study. Because of the distortion of structures and the fixation, landmarks were ill defined. The laboratory report stated that no spirochetes on dark field examination or tubercle bacilli were visible and that on culture pneumococci, streptococci and gram-negative diplococci of the Micrococcus catarrhalis type predominated.

There was then unquestioned mediastinal disease, which was interpreted as true tuberculosis of the mediastinum[14] with secondary invasion of the upper lobe of the right lung by direct extension. (We have demonstrated this type of invasion at autopsy in an adult after Hodgkin's disease.) The duration of the attack argued against either Hodgkin's disease or malignant growth.

Subsequently, we aspirated pus from the upper lobe of the right lung. At the last bronchoscopy, on Aug. 17, 1933, there was no pus and all evidence of tracheal and bronchial compression had disappeared. This surprising involution was confirmed by a roentgenogram, which showed marked clearing. At no time was high voltage roentgen therapy, which might have accounted for this involution, used.

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14. Kornblum, Karl, and Cooper, David A.: Tuberculous Mediastinitis, Am. J. Roentgenol. **23**:276 (March) 1930.

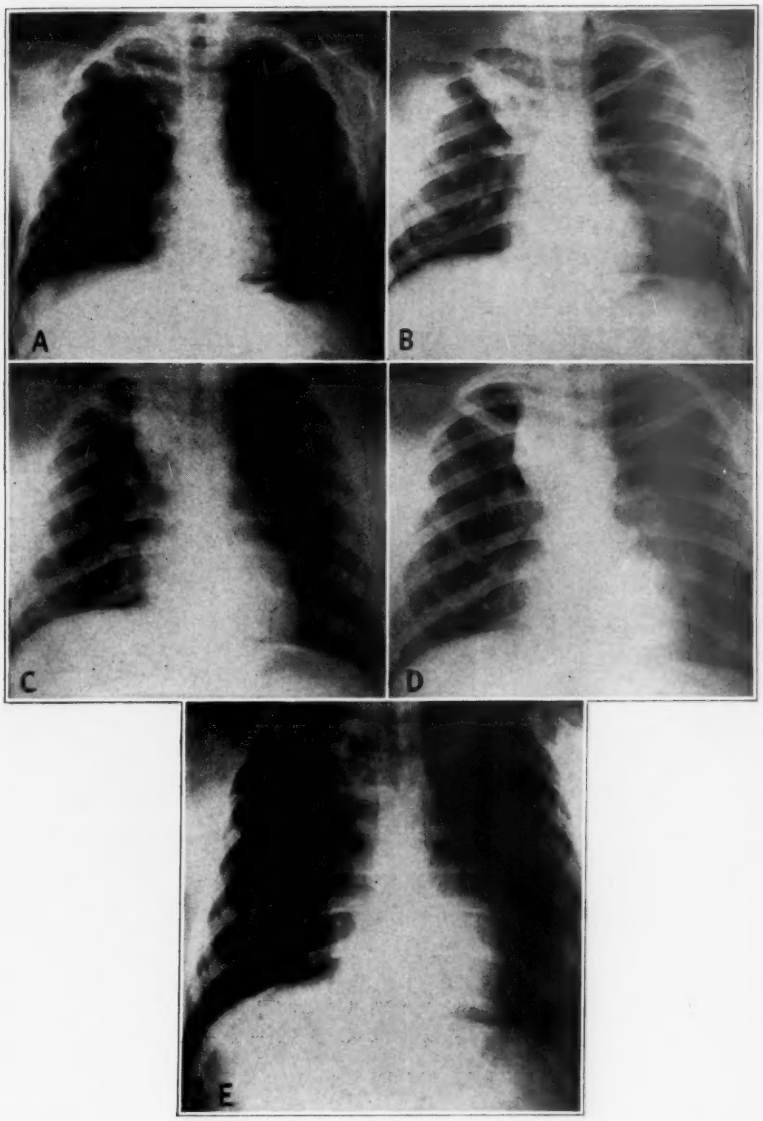


Fig. 13 (case 7).—*A*, taken on Sept. 8, 1927, shows the lungs of a girl aged 8 years. A cone-shaped shadow extends from the right border of the mediastinum into the mesial aspect of the upper lobe of the right lung. The reaction to an intradermal tuberculin test with 0.001 mg. was positive. *B*, taken on Sept. 20, 1930, shows an extension of the pathologic process. *C*, taken on March 27, 1931, shows a sharp demarcation of the shadow on the right. *A*, *B* and *C* were provided by Dr. P. P. McCain, of the North Carolina Tuberculosis Sanatorium. *D* was taken at the Charlotte Eye, Ear and Throat Hospital on May 8, 1933, when the patient was 14 years of age. Bronchoscopy strongly suggested a pathologic condition in the mediastinum and showed pus coming from the upper lobe of the right lung. The upper lobe was felt to be secondarily involved by direct extension of tuberculous mediastinitis. No tubercle bacilli were observed, however. *E* shows the later clearing of the upper lobe and the marked involution of the mediastinal disease six years after the onset. Bronchosopic study confirmed these findings. The child has remained afebrile and free from symptoms for two years.

Here, bronchoscopy was probably only an incidental factor in the clinical improvement. Its chief value was diagnostic.

CASE 8.—*Pneumonitis complicating chronic infection of the upper part of the respiratory tract.*

The patient was a white boy aged 8 years who was sent to our clinic on Aug. 3, 1931, from the North Carolina Tuberculosis Sanatorium. A diagnosis of either pneumonitis or bronchiectasis had been made and bronchoscopic examination advised because a roentgenogram showed a small circumscribed area of density at the outer border of the heart on the right side between the fourth and the sixth rib anteriorly.

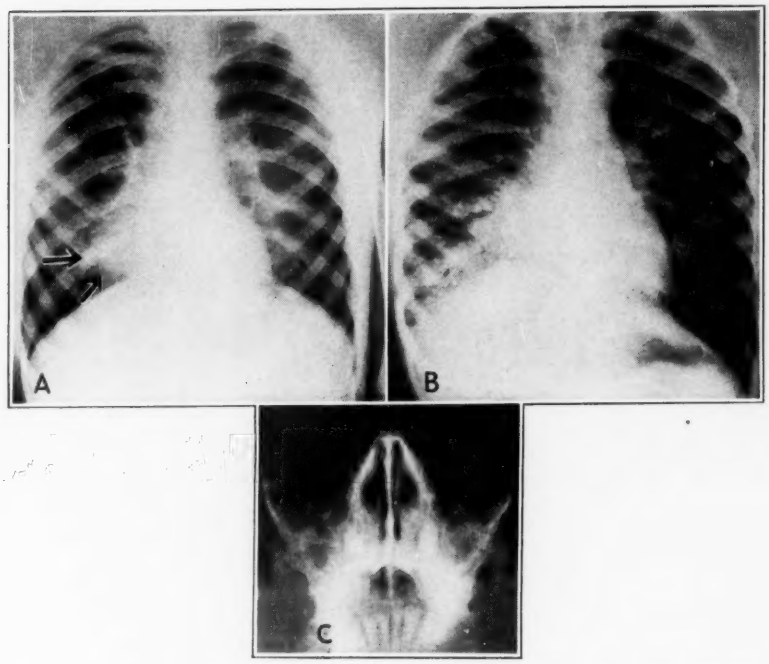


Fig. 14 (case 8).—*A*, roentgenogram of the lungs of an 8 year old boy, showing heavy hilar shadows and a circumscribed area of density in juxtaposition to the right border of the heart between the fifth and the sixth rib anteriorly. These markings probably represent pneumonitis. Bronchoscopy showed pus coming from the middle lobe of the right lung. *B*, the lungs after a phrenicectomy had been done. The operation accounts for the highness of the diaphragm on the right side. Lipoiodine has been instilled through a catheter into the trachea with the patient leaning to the right and forward to get some filling of the middle lobe. No bronchiectasis is shown. *C*, roentgenograms of the sinuses, showing marked involvement of the antrums. This involvement was overlooked for two years. The patient became free from fever only when drainage was established.

The history did not reveal either aspiration of a foreign body or any previous acute infection of the respiratory tract.

Examination disclosed a much underweight child with a chronic productive cough. There were large, diseased tonsils. Sinus infection, if present, was overlooked at this time. There were rather loud and moist râles at the base of each lung.

Bronchoscopy was carried out with a no. 6 bronchoscope. Considerable pus was present in both sides of the bronchial tree. The lower part of the left bronchus contained some thickened, reddened tissue (probably secondary to contaminating pus from the right side, as shown by subsequent bronchoscopies) from which material for biopsy was taken. The pathologic report stated that this consisted largely of a piece of cartilage with supporting connective tissue and contained one lobule of a mucous tubular gland. No evidence of a malignant process and no specific inflammatory infiltrates were seen. Dark field examination revealed no spirochetes. Several examinations of bronchoscopically aspirated specimens revealed no tubercle bacilli. The Wassermann reaction was negative.

After several bronchoscopies the pus was seen to be coming exclusively from the orifice of the middle lobe of the right lung. Lung mapping carried out bronchoscopically failed to show bronchiectasis of any extent.

On Oct. 13, 1931, because the child failed to respond to bronchoscopic treatment, we referred him to Dr. James Gibbon, who performed a phrenic exeresis. He was apparently benefited by this procedure.

However, two years later we requested that the child be brought back for a follow-up examination. Bronchoscopy at this time still showed considerable pus coming from the middle of the right lung. The left bronchus was normal.

The child was underweight and had the same chronic productive cough. A roentgenogram showed the same circumscribed area of increased density just lateral to the cardiac shadow and between the fourth and the sixth rib anteriorly. Lung mapping was again carried out, a rubber catheter being inserted into the trachea with the child under local anesthesia. Ten cubic centimeters of lipoiodine was then injected slowly, with the patient leaning to the right and forward so as to get some filling of the middle lobe of the right lung. No appreciable bronchiectasis was demonstrated. There was some abnormal filling of the middle lobe, the position corresponding to that of the area of density previously described, which was interpreted as being due to pneumonitis. The area was hardly large enough for a cavity.

We then became suspicious that a source of infection had been overlooked. A roentgenogram of the patient's sinuses showed both antrums full of pus; this finding was proved by subsequent irrigation. A culture of material from the right antrum gave a pure growth of pneumococcus; a culture of material from the left antrum was sterile.

A bilateral intranasal antrotomy was done with the child under local anesthesia. Simple irrigation was continued. Later, also with local anesthesia, the tonsils were removed. A culture of these was reported as predominantly streptococcic.

A culture of a bronchoscopically aspirated specimen taken at this time showed a mixed growth of streptococci, gram-negative cocci and gram-negative bacilli. The gram-negative cocci were overwhelmingly predominant in the lowered oxygen tension tube. This organism is a member of the catarrhalis-flavus-crassus group.

The antrums were periodically irrigated, but bronchoscopies were stopped. For the first time in over two years protracted temperature charts kept at home showed the boy to be free from fever. The cough was less severe. There was some gain in weight.

At the end of the third year another bronchoscopy was done. A small amount of thick pus was still coming from the orifice of the middle lobe of the right lung. The amount was less than formerly.

Culture of a bronchoscopically aspirated specimen showed a pure growth of the gram-negative coccus which had predominated in the culture the previous year. This coccus was therefore considered of pathologic significance, and a vaccine was prepared and administered by the family physician.

On March 9, 1935, the child was again brought back for examination. The sinuses were clinically satisfactory. Bronchoscopy still showed pus coming from the right middle bronchus, but the amount was less than it had ever been. Culture gave a pure growth of a gram-negative coccus. The roentgenogram for the first time showed much lessening of the shadow.

There are interesting paradoxes here. Material from the antrum gave a culture of pneumococci. The bronchoscopically aspirated pus consistently showed an organism of the Micrococcus catarrhalis group. The child became free from fever only after the surgical treatment of foci in the upper part of the respiratory tract. The chest, however, improved most after the use of an autogenous vaccine of the gram-negative coccus. At the end of five years the child is still not completely well, but the outlook seems better.

In sequence, pneumonitis which progressed to cavity formation, i. e., a pulmonary abscess, is considered. A priori, one should be able to outline a cavity or cavities on stereoscopic films or to demonstrate a fluid level fluoroscopically. The mode of onset of pulmonary abscess is still a debated question. Is the condition embolic? Is it due to inspiration of infectious material? Are both factors involved?

As to emboli, Holman[15] has produced abscess experimentally by the use of sterile emboli. Clerf[16] mentioned that Van Allen and his co-workers showed that the chronicity and the virulence of embolic abscess are enhanced by the insufflation of infectious material; that an embolic abscess is more likely to occur, because embolism lowers the blood supply of the very vascular lung to a level of other tissues; that an abscess develops more rapidly from an embolus than by intrabronchial inoculation, and that lung tissue normally seems more resistant to necrosis and suppuration than other tissues.

The postoperative abscess occurring most frequently, and the one especially interesting to both otolaryngologists and pediatricians, is the posttonsillectomic abscess. Curiously, pulmonary abscess is infrequent in the first decade. Flick[17] and his co-workers reported that only

15. Holman, Emile: Post-Tonsillectomic Pulmonary Abscess, Arch. Otolaryng. **11**:287 (March) 1930.

16. Clerf, Louis H.: Peroral Endoscopy, Arch. Otolaryng. **11**:343 (March) 1930.

17. Flick, John B.; Clerf, Louis H.; Funk, Elmer H., and Farrell, John T.: Pulmonary Abscess, Arch. Surg. **19**:1292 (Dec.) 1929.

6.4 per cent of 172 cases of varied origin occurred in this period. One-half the cases were in persons between the ages of 20 and 40. Clerf [18] analyzed 77 of his own cases of posttonsillectomic abscess and reported that 65 per cent were in persons between the ages of 20 and 40. In only 4 cases was local anesthesia used.

These clinical observations suggest the importance of the inhalation type of infection rather than the embolic because: (1) The great majority of cases occur after general anesthesia, and (2) they occur at a period of life in which much deeper anesthesia is required than is required for small children. Young children can be operated on rapidly when they are under light anesthesia with relatively little hemorrhage. All otolaryngologists know that the reverse is usually true when one is operating on an adult under general anesthesia.

These facts are apparently corroborated by my own and my co-workers' experience. In eight years 4,028 tonsillectomies were done with the patient under ether anesthesia. A great majority of the patients were under 10 years of age. The records were not reviewed individually, but the four members of the staff who performed the operations recalled no pulmonary abscesses. If one allows for faulty memory or inaccurate records, it still seems that abscesses are uncommon in the first decade.

A few cases of pulmonary abscess are listed. The related roentgen records, however, show little or simple postoperative pneumonitis. Thus the word abscess was loosely used.

Such a case is case 9. Since this is supposed to be a practical paper, it may with propriety be included. Academic considerations must not obscure the best interests of the patient.

Perhaps it would be better to divide this type of pulmonary infection into postoperative abscess and postoperative pneumonitis, depending on the stage of the pathologic process. At any rate, bronchoscopy is indicated in each instance.

Epitomizing, it seems that either embolus or inspiration may be a factor. The former probably causes the rapidly forming abscess in an acutely ill patient.[3] (I have seen multiple cavitation in one lobe of a 20 year old girl three weeks after a tonsillectomy performed with ether anesthesia.) On the other hand, the more slowly forming abscess apparently results from simple postoperative pneumonitis of the inspiration or obstructive type.

CASE 9.—*Posttonsillectomic pulmonary suppuration.*

A white girl aged 7 years was admitted to the hospital on June 10, 1933, because of cough, a temperature of 102 F. (by mouth) and prostration. She had had a tonsillectomy and adenoidectomy two weeks previously. Her roentgenogram,

18. Clerf, Louis H.: Pulmonary Abscess Following Tonsillectomy: Bronchoscopic Considerations, Arch. Otolaryng. **11**:192 (Feb.) 1930.

curiously, was essentially normal. Unfortunately, a lateral view was not taken. At bronchoscopy, however, foul-smelling pus was aspirated from the orifice of the upper lobe of the left lung. The child made a complete and permanent recovery after six bronchoscopic aspirations carried out every two to four days with the instillation of monoparachlorophenol. All were done with a no. 5 bronchoscope.

I add one last thought to a consideration of this phase of pulmonary ascess in children. Careful observation for a pulmonary infarct in a child was rewarded not long ago. A boy aged 6 years in whom bilateral mastoiditis developed after measles was operated on by my associate, Dr. F. E. Motley. In the course of convalescence a sudden flare of temperature raised the question of a lateral sinus

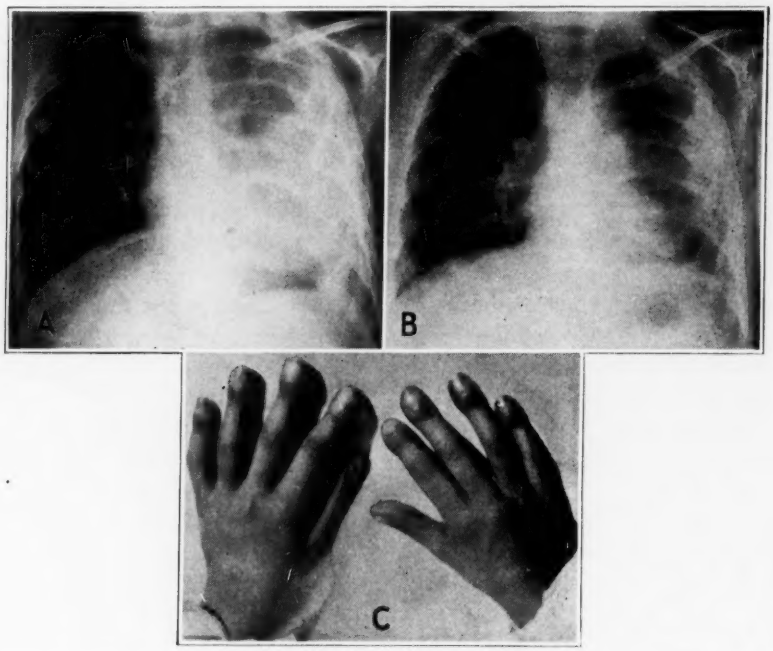


Fig. 15 (case 10).—*A*, roentgenogram of the lungs of a girl aged 6 years, showing a postpneumonic abscess of the upper lobe of the left lung which lasted fourteen months. There was secondary pneumonitis of the base of the left lung. *B*, the end-result after seven bronchoscopic aspirations. Clinically the child has remained well for five years; there is slight residual thickening of the pleurae on the left. *C*, clubbing of the fingers, showing the chronicity of the process.

infection. There were also some vague signs referable to the chest. A roentgenogram of the chest showed a sharply circumscribed area of density in the periphery of the right lung. A blood culture showed a gram-positive micrococcus which we were not able to identify positively. However, the pathologic process in the chest underwent spontaneous resolution with no particular treatment, and the patient went on to complete recovery. (See fig. 17.)

One may now consider other types of pulmonary abscess.

CASE 10.—*Postpneumonic pulmonary abscess.*

The patient was a white girl aged 6 years who was referred to us on Dec. 3, 1930. A roentgenogram showed a frank abscess cavity of the upper lobe of the left lung with some increase in density of the lower lobe. (The increase in density proved later to be secondary to the gravitation of the pus from above into this area.) The chronicity of the infection was indicated by marked clubbing of the fingers.

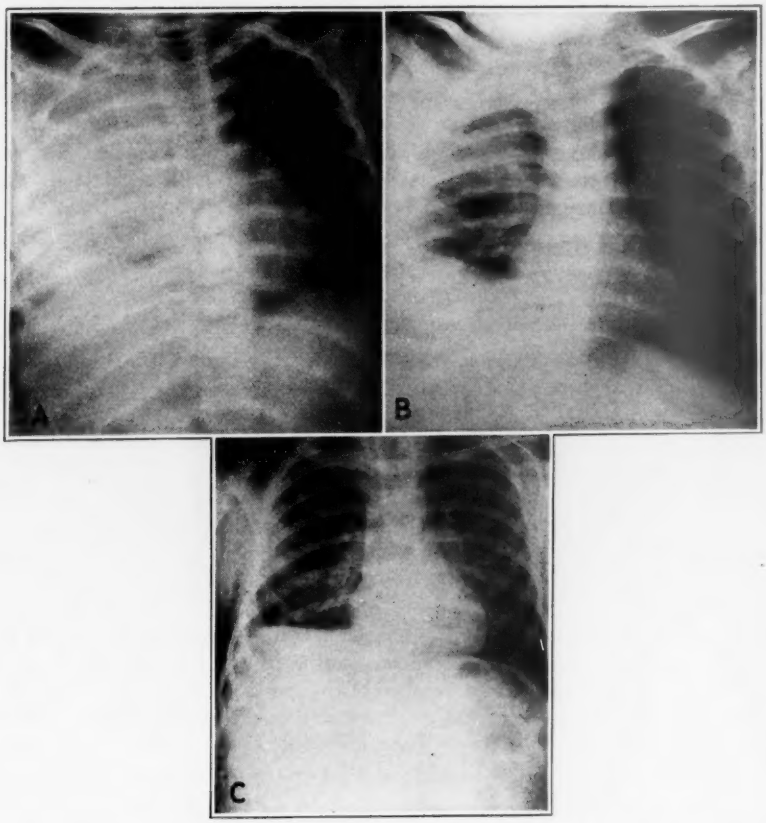


Fig. 16 (case 11).—*A*, roentgenogram of the lungs of a boy aged 9 years with high grade diabetes, showing extensive pneumonitis with indefinite limitations in the right lung. *B*, after one bronchoscopic aspiration of much pus from the right bronchus. An apparent abscess is now visible. *C*, the end-result after five bronchoscopic treatments. The asymmetry of the right costophrenic angle is probably due to adherent and thickened pleurae. The child has remained free from pulmonary symptoms for three years.

Ten months previously the child had had whooping cough followed by pneumonia. Since then, productive cough with odor, loss of weight and intermittent fever had persisted.

Bronchoscopy with a no. 5 bronchoscope showed much ill smelling pus coming from the upper lobe of the left lung. This was suctioned off, and 10 cc. of cajuput oil was instilled. A bronchoscopic specimen contained no tubercle bacilli. The procedure was carried out seven times, with complete and permanent clinical recovery.

CASE 11.—*Abscess complicating diabetes.*

This case is also reported because of its unusual clinical interest. The child had been in diabetic coma three times. At the time of writing he is still living and free from symptoms referable to the chest.

A white boy aged 9 years was seen by Dr. E. J. Wannamaker, internist, on May 3, 1933, because of cough and fever. The child had high grade diabetes, with a blood sugar content which had been as high as 466 mg. per hundred cubic centimeters. The ear, nose and throat revealed nothing abnormal. At the base of the right lung there were diminished breath sounds, bronchophony, egophony and dulness. A roentgenogram showed marked density of the whole right lung. Whether this pneumonitis was complicated by an abscess cavity could not be definitely determined at this time. Pleural puncture had yielded negative findings.

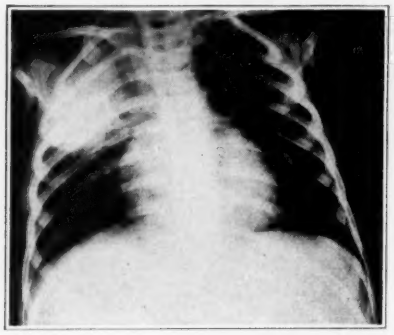

Fig. 17.—A roentgenogram of the chest of a 6 year old boy with bilateral post-measles mastoiditis taken postoperatively during a recrudescence of fever. A blood culture was positive. Note the sharply circumscribed shadow in the periphery of the upper lobe of the right lung. It probably represents an infarct. The outcome in this case was spontaneous resolution.

Bronchoscopy with a no. 5 bronchoscope showed frank pus from the bronchus of the lower lobe of the right lung. An abscess cavity was demonstrable after the first bronchoscopy. Complete recovery followed five bronchoscopies with the instillation of a few cubic centimeters of monoparachlorophenol each time.

A culture of bronchoscopically aspirated pus was reported as containing Staphylococcus albus and was negative for tubercle bacilli. A dark field examination revealed no spirochetes but did show some yeast cells. Culture on Sabouraud's medium gave no growth.

During this treatment the child was of course under rigid diabetic management, by Dr. Wannamaker.

### BRONCHIECTASIS SECONDARY TO A NEGLECTED FOREIGN BODY

Most of our patients have had multiple bronchiectasis, as shown by lung mappings. In some of them the condition developed within three

months of the inspiration. Once established, the treatment by every conservative method is discouraging. Repeated bronchoscopy, phrenicectomy and even prolonged pneumothorax will not bring about a complete cure. Hence the importance of early removal of the foreign body. I hope to cover this phase in another paper to be published shortly. It is mentioned just to complete the outline.

Of course, bronchiectasis in children is occasionally seen in which a foreign body has apparently played no part. Clerf mentioned this fact.[19] The etiology in such cases is likely to be difficult to explain. The questions of congenital malformation, infection of the nasal accessory sinuses and neglected pulmonary suppuration in earlier life all arise. This phase of the subject, then, is not elaborated on here.

## SUMMARY AND CONCLUSIONS

A discussion of the pulmonary diseases of infancy and childhood is presented from the bronchoscopic point of view. The presence of a foreign body was excluded as a primary consideration. The subject is discussed under the following heads: (1) congenital defects, (2) primary bronchial diphtheria, (3) suppurative pneumonitis, acute or chronic and with or without cavity formation, and (4) bronchiectasis secondary to a neglected foreign body.

Illustrative cases are reported under related headings. An effort was made to attain two objectives: (1) to correlate the whole subject in one paper for persons interested and (2) to show the wide range of the diagnostic and therapeutic value of bronchoscopy and its safety under carefully controlled conditions.

The bacteriologic and pathologic reports were made by Dr. L. C. Todd. All roentgenologic work not otherwise specified was done by Mr. W. E. Roberts.

19. Clerf, Louis H.: Bronchoscopy as an Aid in Diagnosis of Pulmonary Diseases, Tr. M. Soc. North Carolina, 1935, p. 273.

# News and Comment

## GENERAL

**Fourth International Congress of Pediatrics.**—The American committee for the Fourth International Congress of Pediatrics, to be held in Rome, wishes to call attention to the final dates which have been fixed, namely, Sept. 27 to 30, 1937.

Tentative plans for the congress which have recently been announced by the central committee are as follows: The first day is to be devoted to a consideration of "Mineral and Water Metabolism in Infancy." This subject will be discussed by Drs. James L. Gamble, of Boston; E. Freudenberg, of Marburg; Noah Morris, of Glasgow; Czapo, of Budapest; Gorter, of Leyden; Speransky, of Moscow; Von Reuss, of Vienna; Toverud, of Oslo, and others.

The second day will be devoted to "Tuberculosis in Infancy." Among those already scheduled to participate in the discussion are Drs. Chester Stewart, of Minneapolis; Dufour, of Lyon; Brinchmann, of Oslo; Capon, of Liverpool; Wallgren, of Göteborg; Debré and Armand-Delille, of Paris; Parsons, of Birmingham; Noeggerath, of Freiburg; H. Koch and Nobel, of Vienna, and Jemma, of Naples.

The third day will be devoted to a discussion of "Neuropsychiatric Disorders in Pediatrics from the Clinical and Social Point of View." Among those already scheduled to participate are Drs. Dingwall-Fordyce, of Liverpool; Glanzmann, of Bern; Jundell, of Stockholm; Frederick H. Allen, of Philadelphia; Babonneix, of Paris; Barbosa, of Rio de Janeiro, and Sychareva, of Charkov.

The fourth day will be devoted to communications on miscellaneous topics.

Those interested in public health may wish to remain for the meeting of the International Congress for the Protection of Infancy, which will take place in Rome immediately after the Congress of Pediatrics.

The Italian committee is reported to be preparing a program of entertainment for the members of the Congress of Pediatrics which will vie with the hospitality shown them at Stockholm and at London.

**Physicians Certified by American Board of Pediatrics.**—The following physicians have been certified by the American Board of Pediatrics since the last report: William Nathaniel Braley, Highland Park, Mich.; Florence A. Browne, Detroit; Darcy Milliman Dayton, Tacoma, Wash.; Ray S. Friedley, Akron, Ohio; Hal Rexford Hoobler, Oakland, Calif.; Wilfred C. Hulse, New York; Dennis Daniel Kovan, Detroit; Frank C. Leeming, Chicago; Gordon Manace, Toronto, Canada; Abe Matheson, Chicago; Marsh William Poole; Detroit; Armin Rembe, Seattle; F. Blair Sullivan, Chicago.

None of these physicians were examined.

**International Congresses.**—The Third International Congress and the Twelfth National Congress for Vacation Camps and Activities in the Open Air will be held in Paris, July 1 to 4, 1937.

The International Congress for the Protection of Childhood will be held in Paris, July 19 to 22, 1937.

The International Congress for the Protection of Infancy will be held in Rome, Oct. 4 to 8, 1937, after the International Congress of Pediatrics.

**Journées Médicales Internationales de Paris.**—This event has been organized by the *Revue médicale française* and will be from June 26 to 30, 1937.

The program includes meetings and entertainment, consisting of visits to the exposition, including a night visit, a gala event at the Théâtre des Champs Elysées,

a reception at the city hall, a night illumination on the Seine, a personally conducted tour of the Museum of the Louvre and a banquet. The subscription is 100 francs for physicians, pharmacists, veterinarians and biologists and entitles the subscriber to a "Volume of Reports" of more than 500 pages. Subscriptions should be sent to Dr. Louis Lamy, Treasurer of the *Journées Médicales*, 18 Rue de Verneuil, Paris.

## PERSONAL NEWS

**Dr. William Park Honored.**—Dr. William H. Park, founder of the public health laboratories of New York, received the George M. Kober medal from the Association of American Physicians on May 5 at the closing session of the fifty-second annual convention of the association, at Atlantic City, N. J.

# Abstracts from Current Literature

## Anatomy and Physiology

HISTOLOGICAL STUDY OF THE NORMAL MAMMA. E. K. DAWSON, Edinburgh M. J. **42**:633 (Dec.) 1935.

Infection of the maternal breasts, with abscess formation, may occur at any stage of pregnancy or lactation, more commonly in the early months of pregnancy. The openings of the milk ducts in the nipple are closed by a plug of keratin débris in the resting breast and become patent in lactation, making it easier for infection to come from the surface of the skin.

Reports of adenomatous tumor of the maternal lactating breasts are rare. Most writers have suggested that the tumor antedates the period of lactation. Such a tumor arising during pregnancy and lactation shows active secretion, just as does the surrounding normal mammary tissue. Later it undergoes involution like that of the normal mammary tissue.

The author reports that there is no evidence that proliferation of the breasts and their functions during pregnancy and lactation are associated with the genesis of benign or malignant tumor. Benign or malignant tumor found during pregnancy or lactation is a preexisting growth.

NEFF, Kansas City, Mo.

## Biochemistry; Bacteriology, and Pathology

SUSCEPTIBILITY OF THE GUINEA-PIG FETUS TO THE SUBMAXILLARY GLAND VIRUS OF GUINEA-PIGS. F. S. MARKHAM and N. P. HUDSON, Am. J. Path. **12**:175 (March) 1936.

Infection of the fetus of the guinea-pig with submaxillary gland virus is described. Typical inclusion bodies were found and were taken as an indication of the presence of the virus. On this basis, the virus was apparently generalized throughout the fetus. Lesions appeared in most of the organs, especially in the brain, liver and placenta. When death occurred, it seemed to be due to interference with the circulation by lesions in the placenta and liver. It was determined that the fetus is better suited in many respects for experimental work with the submaxillary gland virus than the new-born or young guinea-pig. Interference from spontaneous infections is avoided, smaller amounts of virus can be detected, and the yield of virus is greater. The susceptibility of the fetus is not altered by the immune state of the mother.

MOORE, New York. [FROM THE AUTHORS' SUMMARY.]

EFFECTS OF CARBOHYDRATES ON BACTERIAL GROWTH AND DEVELOPMENT OF INFECTION. STANHOPE BAYNE-JONES, Bull. New York Acad. Med. **12**:278 (May) 1936.

While much information is available on the effect of carbohydrate on bacterial growth in vitro, relatively little is known regarding the processes of infection and resistance to bacterial invasion in the living organism. Even less definite information exists concerning the effects of various concentrations of carbohydrate on the functions of the cells affecting bacterial growth in tissues.

This paper is devoted to a discussion of known bacteriologic phenomena, with a bearing on clinical effects. In some cases these phenomena appear paradoxical in the light of the notorious susceptibility of the diabetic patient to various infections. Thus, experiments showed that blood (in a test tube) to which was added a 0.1 to 0.5 per cent solution of dextrose was no more suitable as a culture medium for staphylococci than the control samples without added sugar. Also, a concentration of dextrose of 1 per cent or more in peptone medium may inhibit the

production of indole by Bacillus coli or prevent elaboration of proteolytic and liquefying enzymes by various organisms. After enumeration of other experimental results the author concludes that the concentration of blood sugar in the diabetic patient has little or nothing to do with his resistance or susceptibility to bacterial infection. Such factors as dehydration may operate through some as yet unknown mechanism. Influences of disturbed endocrine activity may some day explain not only the distorted carbohydrate metabolism but also the unknown means by which the body cells resist bacterial invasion and their toxic by-products.

JAHR, Omaha.

EVALUATION OF MERCURIAL ANTISEPTICS IN THE PRESENCE OF SERUM. DOROTHEA E. SMITH, E. J. CZARNETZKY and STUART MUDD, J. Bact. **31**:7 (Jan.) 1936.

Smith, Czarnetzky and Mudd compare the germicidal action of several mercurial antiseptics in a solution of sodium chloride and in 80 per cent serum. An accurate method of plating was used, and the time and concentration required for killing 50 per cent of a culture of a smooth strain of Bacterium typhosum were taken as a basis of comparison. Metaphen, merthiolate, mercurochrome and mercury bichloride all combine with the proteins of the serum. The ratio of the rate with which the mercury of the mercurial compounds combines with bacteria to the rate with which it combines with the proteins of the serum is more favorable in the case of some of the mercurial compounds than with the others. The authors express the belief that these compounds kill bacteria only in proportion to their content of mercury. The decrease in germicidal activity of the compound when it is used in serum is proportional to the amount of mercury chemically combined with the serum. Thus, it seems that the effect of serum is such that metaphen, merthiolate, mercurochrome, or mercury bichloride may not be administered intravenously as an antiseptic.

STOESSER, Minneapolis.

RELATION OF BACTERIAL VARIABILITY TO CHANGES IN THE CLINICAL ASPECTS OF EPIDEMICS. A. VEDDER, Maandschr. v. kindergeneesk. **5**:57 (Nov.) 1935.

The instability of the *genus epidemicus* may be caused by alterations in the subjects and of the "milieu" and by bacterial variability. Little is certainly known of the relation between *genus epidemicus* and bacterial variability. In epidemics of such conditions as atoxic dysentery, plague, diphtheria, pseudotuberculosis, pneumococcosis, smallpox and Weil's disease there exists, however, in the author's opinion a relation between the genius of the disease of the epidemic and the variation of the etiologic microbe. The variation may occur within or outside the human body.

VAN CREVELD, Amsterdam, Netherlands.

## Metabolism; Infant Feeding; Milk and Other Foods

A STUDY OF THE MAGNESIUM NEEDS OF PRESCHOOL CHILDREN. A. L. DANIELS and G. J. EVERSON, J. Nutrition **11**:327 (April) 1936.

Several earlier workers had observed tetany in calves which were receiving rations containing little magnesium. For this reason Daniels and Everson investigated the magnesium needs of children. In this study observations were made on thirteen children (ten boys and three girls) from 4 to 7 years of age. The magnesium content of the diet was controlled by using varying quantities of specific foods. The vitamin requirements were adequately cared for. Studies of the calcium and phosphorus needs were made at the same time in order to determine to what extent these may influence the retention of magnesium.

The magnesium retention varied from 0.4 to 3.1 mg. per kilogram. It was considered in relation to the intake of magnesium, the urinary output of the element and the influence of the calcium-magnesium ratio.

The results indicated that diets of children of the ages studied should contain not less than 13 mg. of magnesium per kilogram of body weight.

MUNNS, Winnetka, Ill.

IODINE NUMBER OF SERUM FATTY ACIDS IN ACUTE INFECTIONS OF INFANTS WITH AND WITHOUT ECZEMA. A. V. STOESSER, Proc. Soc. Exper. Biol. & Med. **34**:12 (Feb.) 1936.

This paper presents the observations made on 14 infants with various acute febrile illnesses. Samples of blood were obtained at the height of infection and during convalescence. A fall in the total value for fatty acids of the plasma takes place during the height of acute infection in infants and parallels a drop in the iodine absorption value. This signifies that in most instances the iodine number of the fatty acids of the serum is definitely lower in the febrile period of the disease than during the period of recovery. The already moderately low iodine number of the fatty acids of the serum in eczematous babies is still more reduced by acute respiratory disease, and there is a tendency for it to remain at low levels for some time. This slow return to higher levels was also observed in the infants without eczema. However, the children with pneumonia had a more rapid fall in the iodine number, with a quick return to normal levels after the pneumonia had completely resolved.

HANSEN, Minneapolis.

NUTRITIVE VALUE OF CLEAR SOUPS. W. F. CHRISTIE, Practitioner **136**:321 (March) 1936.

This subject is presented for the aid of physicians who wish to use soups in the treatment of diabetes or obesity or in light diets. Tables showing caloric values are presented, and detailed instructions for the preparation of soups are given.

SAPPINGTON, San Francisco.

INFLUENCE OF ULTRAVIOLET RAYS ON THE SECRETION OF BREAST MILK. A. ANTONOV, Arch. de méd. d. enf. **39**:216 (April) 1936.

Since the contribution of Chisolm and McKillop, in 1927, on the beneficial effects of treatment with ultraviolet rays during lactation, a number of observers have employed this agent, with varying results. Antonov abstracts their reports and reviews in considerable detail sixteen cases observed in his own clinic at Leningrad. His conclusions are to the effect that irradiation of the breast exercises no influence on the secretion of milk. So many factors enter into this function, including nutrition, the period of lactation and the emotions, that it seems quite impossible to establish in an objective manner the usefulness of any accessory stimulus.

AMESSE, Denver.

INFLUENCE OF THE PRECEDING DIET ON THE CHILD'S BLOOD SUGAR CURVE. A. BERTAZZOLI, Riv. di clin. pediat. **34**:289 (April) 1936.

Several blood sugar curves were plotted for each of twelve children following the ingestion of 1 Gm. of sugar per kilogram of body weight. The blood was withdrawn for analysis just before, and one-half hour, one hour, two hours and three hours after, the ingestion of the sugar. The child's previous diet was carefully prepared. The diets used were (1) a normal mixed diet; (2) a diet high in carbohydrate (protein 11 per cent, fat 14 per cent and carbohydrate 75 per cent); (3) a diet high in fat (protein 11 per cent, fat 57 per cent and carbohydrate 32 per cent—the diet of Gerson), and (4) a ketogenic diet (protein 34 per cent, fat 59 per cent and carbohydrate 7 per cent).

The peak of each curve occurred one-half hour after the ingestion of the sugar. The curves were highest when the previous diet was ketogenic. The diet rich in fat led to higher rises in blood sugar than the mixed diet, and the diet rich in carbohydrate was followed by the lowest drop in blood sugar.

HIGGINS, Boston.

VALUE OF HONEY IN THE FEEDING OF THE INFANT. A. FARIOLI, Riv. di clin. pediat. **34**:337 (April) 1936.

Honey contains between 18 and 20 per cent water and 35 per cent dextrose, 38 per cent levulose and 6 per cent saccharose; dextrins are present, according to the type of the honey, in amounts of from 0.5 to 10 per cent; protein in amounts of from 0.7 to 1 per cent; honey contains 0.5 per cent organic acids, mainly formic acid, lactic acid and malic acid; the ash constitutes between 0.2 and 0.35 per cent and consists of distinct amounts of manganese and traces of iron; vitamins A and B are present, and vitamin C may sometimes be present. The caloric value of honey is approximately from 3.2 to 3.3 calories per gram.

Eighteen infants were given a formula containing sugar for twelve days, and then the sugar was replaced by honey for a similar period. Glycosuria occurred with none of the children on either diet. In comparison with cane sugar (sucrose) honey did not increase the blood sugar. The gain in weight on each diet was the same—10 Gm. per day. The $p_H$ of the feces with the diet containing sugar varied between 7.2 and 7.8, and that with the diet containing honey, between 6.5 and 7.6; in thirteen of the children the feces were more acid on the honey-containing diet; in five the results were the same. A much higher percentage of definite gram-positive bacilli was found in the feces of the children on the diet containing honey.

Honey was well tolerated and could be given in as high concentration as 20 per cent. On the diet containing honey, the feces were homogeneous, creamy, non-fetid and somewhat light-colored.

HIGGINS, Boston.

WATER METABOLISM IN INFANCY. W. LAGES, Arch. de pediat., Rio de Janeiro **7**:328 (April) 1936.

The human embryo at two months after conception is 93 per cent water, at eight months 75 per cent and at birth 72 per cent. The infant aged 2 months is 70 per cent water, compared with the adult, who is 65 per cent water. The adult eliminates approximately 0.14 Gm. in an hour, while an infant eliminates 0.22 Gm. All of these factors work to raise the temperature of the infant and make the intake of water extremely important.

SANFORD, Chicago.

THE FEEDING OF RURAL CHILDREN. JOSÉ MAZZOTTI, Rev. mex. de puericultura **5**:849 (Nov.) 1934.

The increase in mortality and morbidity among infants and children in the rural communities in Mexico is due not only to a lack of food but to an improper diet. Mazzotti reviews the diets prevalently found in the rural districts and points out their defects. He found that of 1,000 children, 627 were malnourished and 16 per cent showed signs of avitaminosis. He presents case histories showing the various types of avitaminosis. He shows the great need for proper education of these people as to the feeding of infants.

HERRON, Spokane, Wash.

HYPERFATTED MILK IN THE NOURISHMENT OF ECZEMATOUS INFANTS. JAIME DAMIANOVICH and ADOLFO M. CORDIVIOLA, Thesis, Buenos Aires, 1936.

Mother's milk as well as cow's milk is not harmful to children suffering from eczema even if it contains a high percentage of butter fat (average 6.4 per cent to 6.5 per cent). When it is desired to give a food rich in vitamins to a weak child who is either hypertrophic or dystrophic, it is well to give an acid milk formula containing a high percentage of butter fat (Dr. Ernest Gaing) or common milk containing a high percentage of butter fat without taking into consideration the degree of eczema.

AUTHORS' SUMMARY.

THE INFLUENCE OF A DIET LOW IN SODIUM CHLORIDE ON TESTS OF TOLERANCE. AGATHE JUNCK, Monatschr. f. Kinderh. **64**:357, 1936.

Four grams of sodium chloride was used, and the retention was studied during periods in which the diet was low in sodium chloride and in periods in which it was normal. The results were entirely different for the two periods. After the diet low in sodium chloride, there was much greater retention of sodium chloride. Tests of tolerance should therefore be made on children receiving normal diets.

GERSTLEY, Chicago.

THE EFFECT OF FAT AND GLYCERIN ON BLOOD SUGAR. J. KNEIP, Monatschr. f. Kinderh. **64**:359, 1936.

Kneip demonstrates that the addition of fat or of glycerin to the diet has no effect on the blood sugar.

GERSTLEY, Chicago.

CONNECTION BETWEEN PATHOLOGIC LOSS OF WATER AND THE METABOLISM OF SALT. E. KERPEL-FRONIUS, Orvosi hetil. **80**:367 (April 18) 1936.

Experiments on animals show (according to Darrow and Jannet) that when salt is abstracted from the body this is followed by a great loss of water. The loss of water takes place slowly, and the blood serum may be hypo-osmotic for days. When water is abstracted from the body of an animal (giving a strong solution of urea) there is a great loss of water, greater than the loss of salts, so that dehydration of the hyperosmotic type takes place. Dehydration of a similar type may be caused by thirst. It is very important to known in disturbances of water metabolism where the water comes from. Kerpel-Fronius agrees with Gamble that the loss of the water of the binding tissues (extracellular water) is always dangerous and that the loss of the water which is situated in the cells (intracellular water) is less so. The dehydration which follows excretion of salts does not increase the demolition of proteins, but great destruction is caused by the acidosis following thirst.

GÖTTCHE, Budapest, Hungary.

THE DIETS OF NURSING MOTHERS AND YOUNG CHILDREN IN PEIPING. R. A. GUY, Chinese M. J. **50**:434 (April) 1936.

This communication is from the department of public health of the Peiping Union Medical College. The writer discusses the financial and social aspects of dietaries in China and of the substitutes which must be used in that country because of the scarcity of cow's milk and orange juice. The better class of mothers eat 100 eggs or more the first twenty to thirty days after delivery. The mothers of all classes try to get as many eggs as possible during that period. With mothers of the poorest type, the usual diet consists of salt turnip and a mixture of corn flour and soy bean flour. Vitamin C is abundant in fresh turnips; whether it is present in sufficient amount in salt turnip is not known, but that it is seems probable, for scurvy is rarely seen in Peiping. Rickets in infants is nearly always very light, but tetany occurs in children in orphanages and in infants in general. It is well for the infants that they usually receive mother's milk for the first six months. After that, they get tastes of the family's foods, such as those which have just been mentioned for the mother.

Because of the use of white rice and white flour, it is necessary to health to add eggs, meat or milk to the diet, and these are not available to most of the population.

NEFF, Kansas City, Mo.

SUPER-CALORIC FEEDING IN NUTRITIONAL DEFICIENCIES IN INFANTS. M. HASSELMANN-KAHLERT, Chinese M. J. **50**:443 (April) 1936.

A series of twenty-five cases of improper feeding is tabulated by Hasselmann-Kahlert, who practices in Manila, Philippine Islands. She makes a plea for

giving feedings high in calories to nutritionally deficient infants such as are found in China and the Philippines, as well as to normal healthy infants. The complex of symptoms characterized by underweight, constipation, lack of turgor and restlessness is amenable to such feedings in that the nutritional deficiency is overcome. She encountered instances in which an energy quotient equal to 345 calories per kilogram of weight was necessary and was well handled. The concentrated milk formulas were high in carbohydrates and fats but low in protein.

NEFF, Kansas City, Mo.

EXPERIMENTAL NUTRITION STUDIES OF SOYMILK IN HUMAN NUTRITION. H. W. MILLER and C. J. WEN, Chinese M. J. **50**:450 (April) 1936.

Miller and Wen, of Shanghai, state that the protein of the soy bean is its most important nutritional factor. This protein is glycinin, which corresponds rather nearly to the casein of milk but does not form heavy curds when coagulated in the stomach and produces very little uric acid in the body. Allergy does not result from its use.

Soy bean milk (soya milk) can be made up in various formulas paralleling those of cow's milk, so that the infant may be given any desired proportions of food elements. It is well used in diabetic patients without the addition of any carbohydrates. It can be utilized in custards, soups and gravies. It is said to make delicious ice cream. It is free from the dangers of such diseases as are transmitted by cow's milk. It is now possible to get powdered soy bean milk, which is equal in quality to, and tastes better than, that freshly made, and it can be tranported without deterioration.

NEFF, Kansas City, Mo.

STUDIES ON ACETONEMIA. K. SEKI, Orient. J. Dis. Infants **19**:1 (March) 1936.

*Toxicity of Acetone and Its Effect on the Blood.*—The lethal dose of acetone for rabbits was found to be 2 cc. per kilogram intravenously and 6 cc. subcutaneously. The toxic symptoms of dyspnea (irritability and convulsions) appeared with smaller doses, while larger doses produced paralytic symptoms leading to death. The blood showed neutrophilia and severe anemia. Hyperglycemia was observed after a large single injection of acetone, while hypoglycemia developed with small repeated injections. From the rapid appearance of intravenously injected acetone in the spinal fluid, Seki concluded that the toxicity of acetone affects primarily the central nervous system.

*Influence of Age and of the Reticulo-Endothelial System on the Toxicity of Acetone.*—The toxic effect of acetone in young rabbits (average weight, 500 Gm.) was definitely less than that in adult animals, as in the latter the dose had to be doubled to produce death. By blocking the reticulo-endothelial system with injections of india ink, the span of life after injections of acetone was materially shortened.

*Histopathology of Acetonemia.*—Animals given injections of acetone in doses of 1.5 cc. per kilogram were studied at various stages of the poisoning. The liver, spleen, kidneys, lungs, adrenal glands and gastro-intestinal tract all showed passive congestion, with hemosiderosis and hemorrhages. Some evidence of necrosis was also noted in such organs as the liver and adrenal glands. These changes occur gradually and may be identical with acetonemia in man.

*Antiketogenic Action of Dextrose, Insulin, Liver and Bile Preparations and Vitamin B.*—By estimating the disassimilation of acetone bodies after injections of dextrose, insulin, liver and bile acid preparations and vitamin B, Seki found that all these substances, with the exception of bile salt (sodium dehydrocholate), produced some degree of antiketogenesis.

*Effect of Dextrose on the Toxicity of Acetone.*—A slight increase of betahydroxybutyric acid in the blood counteracts the toxicity of acetone if hyperglycemia is present; but if the acid is greatly increased in the presence of hyperglycemia

the toxicity of acetone becomes very pronounced. In the presence of a small amount of acetone in the blood hyperglycemia has a favorable influence on the toxic state. If the quantity of acetone is large, however, hyperglycemia aggravates the toxicity.

KATO, Chicago.

## Vitamins; Avitaminoses

STUDIES ON CRYSTALLINE VITAMIN B: OBSERVATIONS IN DIABETES. MARTIN G. VORHAUS, ROBERT R. WILLIAMS and ROBERT E. WATERMAN, Am. J. Digest. Dis. & Nutrition **2**:541 (Nov.) 1935.

Eleven patients proved to have diabetes were hospitalized for a period of control observation, and when they were as well stabilized as possible, vitamin B was given orally. The usual dose was 10 mg. daily for twenty-eight days. Six, or 54.6 per cent, showed an increased utilization of carbohydrate. Five (45.4 per cent) showed no increase. Two of the six who showed an increase in carbohydrate utilization lost it as soon as the administration of vitamin B was stopped. In four cases the increase continued for periords ranging from two to ten months.

Other experimental references are noteworthy: The experimental deficiency of vitamin B causes a disturbance of the carbohydrate metabolism characterized by a rise in the blood sugar and in the glycogen content of the liver and muscle. Although a diminished carbohydrate tolerance is encountered in other forms of avitaminosis and aberration from the normal state, it is most consistent and marked in experimental vitamin B deficiency.

The clinical syndrome of diabetes mellitus is suggestive of a nutritional disturbance, and there is reason to think that a deficiency of vitamin B may be a factor in the production and clinical course of this condition.

In the discussion of this paper, the most pertinent question was whether the relationship of vitamin B deficiency to diabetes mellitus is coincidental or causative.

MORRISON, Savannah, Ga.

THE PREVALENCE OF VITAMIN A DEFICIENCY AMONG IOWA CHILDREN. P. C. JEANS and Z. ZENTMIRE, J. A. M. A. **106**:996 (March 21) 1936.

Using a photometer test, Jeans and Zentmire made a survey among Iowa school children to determine the frequency of vitamin A deficiency. They found that 26 per cent of a rural group and 53 per cent of a village group presented evidence of such a deficiency. In an urban group of higher economic level a deficiency of vitamin A was found in 56 per cent; in the middle economic level, in 63 per cent; and in the lower level, in 79 per cent. Of seventy-eight children treated and kept under observation, all but three showed normal adaptation for dark after a period of ingestion of vitamin A or carotene.

BONAR, Salt Lake City.

THE VITAMIN CONTENT OF CANNED PINEAPPLE JUICE. N. B. GUERRANT and others, J. Nutrition **11**:383 (April) 1936.

Studies were carried out in order to determine the vitamin A, B, C and G content of commercially canned pineapple juice. Rats were used experimentally in determining vitamin A, B and G potency, and guinea-pigs, in determining vitamin C potency.

Pineapple juice was found to be a good source of vitamins A and B and a fair source of vitamin C; it contained a measurable quantity of vitamin G. Expressed in units, 1 ounce (30 cc.) of this juice revealed the following vitamin contents: vitamin A, 30 U. S. P. units; vitamin B, 20 international units; vitamin G, 2.5 international units, and vitamin C, 40 international units or 4 minimum protective doses.

MUNNS, Winnetka, Ill.

HYPERVITAMINOSIS D. LEWIS THATCHER, Lancet **1**:20 (Jan. 4) 1936.

The case is reported of a baby aged 11½ months who was known to be thriving and free from rickets just before the addition to the daily diet of a considerable dose of cod liver oil with an exceptionally high vitamin D content (exact content not stated). His diet had consisted of raw cow's milk, fruit juice and the customary amount of mixed food, and he had been out in the open air and sunshine a great deal. He died five months after the administration of cod liver oil was started of an illness similar to that described as being caused by hypervitaminosis D. On postmortem examination numerous calcium deposits were found in the medulla, especially at the bases of the pyramids. A few glomeruli also contained calcium deposits.

LANGMANN, New York.

EXCRETION OF VITAMIN B IN HUMAN URINE: ITS DEPENDENCE ON DIETARY INTAKE. LESLIE J. HARRIS, Lancet **1**:886 (April 18) 1936.

By means of the animal test (the bradycardia method of Harris) the vitamin B excretion of human subjects is measured. The results indicate that under normal circumstances only a relatively small amount of the vitamin B taken in the food is excreted in the urine.

LANGMANN, New York.

SIGNIFICANCE OF SPRING IN THE PRODUCTION OF AVITAMINOSES. J. KÜHNAU, Deutsche med. Wchnschr. **62**:621 (April 17) 1936.

Besides infectious diseases, there are others that show higher incidence during the late months of winter and early spring. Most of these seasonal noninfectious diseases are due to deficiency in the vitamins. The deficiency is the result either of diminution in the intake, or of increase in the requirement, of vitamins. A typical example of the universal lack of an abundance of vitamins in the diet during the winter is observed in milk, which contains from two to four times less of vitamins A, C and D during the winter than during high summer.

An increased need of vitamins A and B in the spring may arise from increased thyroid function during this season. Owing to the increase in thyroid secretion, the basal metabolism increases, and so the previously adequate intake of vitamins A and B becomes relatively deficient.

Kühnau goes through the list of typical avitaminoses and points out that all of them reach their maximum incidence during the end of winter and the beginning of spring. He calls this part of the year the biologic spring. The only deficiency disease which does not show increased incidence in the spring is beriberi. The manifestations of this disease correlate with lack of vitamin B and also with increase in the heat and moisture of the air. Atmospheric heat and moisture reach their maximum in different months in the various countries, and this is why a prevalence of beriberi in the spring is obscured.

De Rudder found that crystalline vitamin C inactivates diphtheria toxin. According to him, the high incidence of diphtheria and the high mortality from it in the spring is due to lack of vitamin C in the food during this season.

According to Stub-Christensen, the high incidence of tuberculosis in the spring can be explained on the basis of deficiency in vitamins A and C.

The author stresses the correlation of the diseases which show peaks of incidence during the spring with deficiency in the intake of vitamins. The recognition of this correlation opens the avenues for a more natural therapy.

KERESZTURI, New York.

CHANGES IN THE TEMPORAL BONE AFTER POISONING WITH VIOSTEROL: EXPERIMENTS ON RATS. W. KRAINZ, Monatschr. f. Ohrenh. **70**:6 (Jan.) 1936.

In summarizing his observations Krainz says that the administration of increasing quantities of viosterol to young growing rats results in skeletal changes that resemble those of rickets. In the temporal bone, however, increased decomposition

appears, as well as enormous apposition (building on) of bone tissue. The decomposition involves the enchondral labyrinthine capsule. Not only does the formation of new bone fill the defect that is produced by the decomposition, but by the apposition of wide, noncalcified seams in the vascular canals it results in their stenosis and by endosteal proliferation of the bone in the medullary spaces it results in greater density of the bone. This bony apposition (building on of bone) involves the walls of the tympanic cavity as well as the auditory ossicles. The disturbance in the calcium economy of the organism, which is produced by the acidosis of the blood, in the labyrinthine capsule results occasionally in a calcium stasis in the vessels as well as in calcium deposits on the newly formed bone tissues. The predominance of appositional processes in the temporal bone compared with the changes in the other parts of the skeleton as well as the tendency to bony densification indicates a characteristic of the labyrinthine bone which is probably important in the estimation of its capacity for reaction to experimental irritations and to the effects of acidosis of the blood.

EDITOR'S ABSTRACT. [ARCH. OTOLARYNG.]

SUPERFICIAL KERATITIS AND VITAMIN A. F. STOCKER, Schweiz. med. Wchnschr. **66**:335 (April 4) 1936.

In 1889 E. Fuchs described a condition which he called keratitis punctata superficialis, in which the conjunctiva was moderately inflamed, following which small gray flecks appeared, often in groups, in the central part of the cornea. Vogt studied a similar condition on the advent of the slit lamp but was unable to assign a cause for it. Some thought disease of this type might be related to herpes corneae simplex, while others felt that a physical agent, such as ultraviolet rays, or a chemical caused the disease. Related or similar lesions were given a "nervous" basis. Antiseptic salves seemed to help some patients, while others acquired permanent clouds in the cornea in spite of treatment. Finally evidence accumulated indicating that some general derangement of the bodily tissues is the most important cause of superficial keratitis. Often infants with deficiency disease were found to have a like involvement of the corneas. Increase in the ingestion of vitamin A worked miraculous cures, as demonstrated in three cases cited by Stocker. Not only the local ocular condition was benefited but the patient's general health was markedly bettered. Stocker recommends liver preparations in daily doses of from 8,000 to 16,000 units. Prompt healing of the corneal disease is constantly noted.

MAYER, Chicago. [ARCH. OPHTH.]

DATA ABOUT THE IMMUNOBIOLOGIC EFFECT OF VITAMIN A. G. KÖNIG and W. SEBESTA, Orvosi hetil. **79**:1171 (Nov. 2) 1935.

Thirteen children were given vitamin A for five days. Each dose was from 20,000 to 25,000 international units. Altogether, between 80,000 and 100,000 units was given. The antitoxin content of the blood serum rose in four cases to 2 to 2½ times the original content. The cholesterol content of the blood serum likewise showed some alteration, but no parallel could be shown between the antitoxin content and the cholesterin content.

GÖTTCHE, Budapest, Hungary.

INFANTILE BERIBERI IN SHANGHAI. C. L. KAO, Chinese M. J. **50**:324 (April) 1936.

Kao, a physician in the division of pediatrics of the National Medical College of Shanghai, reviews the history of beriberi in China. He then mentions the general facts about its presence in Shanghai. He states that the diagnosis is easy and that the treatment with vitamin B is smiple and almost as successful as is that with orange juice in cases of scurvy. Sixty-five children were treated in the three years covered by this report. Thirty of the patients were breast-fed infants. The disease as it begins in infants affects mostly the brain, heart, digestive

system and pneumogastric nerves. Exhaustion and paralysis occur early, following symptoms of restlessness, sleeplessness, frequent vomiting and occasional diarrhea. The child cries constantly and becomes exhausted, drowsy, dyspneic and cyanotic.

The cases which Kao reports illustrate the types of beriberi known as congenital, wet, cerebral and atrophic. The disease is widely distributed in China and is fairly common among infants. In the early stages it is promptly cured, and it may be prevented easily by proper prenatal and postnatal care.

NEFF, Kansas City, Mo.

## Hygiene; Growth and Nutrition; Public Health

PHYSICAL AND PHYSIOLOGICAL GROWTH AS A FACTOR IN CHILD ADJUSTMENT. IRA S. WILE, New York State J. Med. **36**:809 (May 15) 1936.

"Physical organization, both in terms of structure and function, is a continuum beginning with conception and extending through the course of life. . . . The nature of the child, his adjustment and his adjustability are outgrowths of life and of living, of being and becoming, of structure and function."

AIKMAN, Rochester, N. Y.

INFANT MORTALITY AS A NATIONAL PROBLEM. JAMES BURNET, M. Digest **3**:410 (Feb.) 1936.

Burnet points out that although infant mortality is decreasing in England it is still high in India. He advocates the establishment of clinics for antepartum care and for supervision of infant welfare. Where such clinics have been established, they have been well attended. It is essential that the physician in charge of the infant welfare clinic shall have special training in the problem of infant feeding, as too often the health officers to whom such work has been given have little idea of the principles underlying the care and nutrition of infants.

LESLIE, Evanston, Ill.

HEALTH AND HANDICAPS OF SCHOOL CHILDREN. J. S. LANKFORD, M. Digest **3**:440 (Feb.) 1936.

In addition to discussing hygienic regulations, such as cleanliness, avoidance of infection, proper seating and lighting in the school room, Lankford emphasizes particularly the necessity for recognition of the handicapped child. Defects in hearing and eyesight, infection of the respiratory and intestinal tract and improper feeding should be recognized by the school authorities and suggestions made to the parents. Information about sex hygiene should not be neglected. Also of great importance is the recognition of insufficiency of the endocrine secretions. Instances in which disease of the pituitary gland has gone on for several years unrecognized are cited. Many children have a mild degree of thyroid insufficiency and are greatly benefited by small doses of thyroid. Even children with cretinism made astonishing progress when treated.

LESLIE, Evanston, Ill.

INADEQUACY OF TABLES OF GROWTH: THE IMPORTANCE OF THE THORACIC PERIMETER AND RESPIRATORY AMPLITUDE; THE DIAMETERS OF NORMAL AND OF FUNNEL-SHAPED CHESTS. MARIE NAGEOTTE-WILBOUCHEWITCH, Bull. Soc. de pédiat. de Paris **33**:627 (Dec.) 1935.

In addition to the usual tables of heights and weights of children of various ages, it is considered important to recognize abnormal thoracic measurements and expansion of the chest. The paucity of such anthropologic studies is mentioned, and tables of transverse and anteroposterior maximal, minimal and average diameters (in centimeters) of normal and funnel-shaped chests of children from infancy to the age of 8 years are given. A pelvimeter was used in making the measurements.

BENJAMIN, Montreal, Canada.

THE STATE'S DUTIES IN REGARD TO CHILD WELFARE: LEGISLATION—THE CHILDREN'S CODE. A. BAEZA GOÑI, Bol. Inst. internac. am. de protec. a la infancia **9**:560 (April) 1936.

The Seventh Pan-American Congress Concerning the Child recommends once more to the governments of affiliated states the fulfilment of the resolution adopted at the fourth meeting, in order that measures for child welfare may be organized coordinately, according to a general plan methodically discussed by child experts, and executed by a central organization directed by technicians, i. e., persons possessing a special knowledge of the social medicine of children and dedicating all their activities to this end.

The principal aim of this agency shall be to coordinate and control the execution of the general program; and each government shall provide it with the necessary funds to meet all the real and actual necessities of the country in that field.

By no means should private initiative be undervalued or despised as long as it conforms to the technical trends and standards determined by the central agency.

LESLIE, Evanston, Ill.

VOCATIONAL GUIDANCE IN PRIMARY SCHOOLS. L. MATA and M. T. STIRPARO, Bol. Inst. internac. am. de protec. a la infancia **9**:574 (April) 1936.

The primary school should promote vocational guidance of its pupils. To that end, it should investigate the psychophysical abilities of its pupils. The "ability file card" should follow every pupil throughout his or her school career. The file card should state the school's judgment of the pupil's vocational capability.

LESLIE, Evanston, Ill.

CLASSIFICATION OF SCHOOL CHILDREN: ITS PROTECTIVE FUNCTION AND ITS ADVANTAGES IN EDUCATION. VILLALBA OLIVA, Bol. Inst. internac. am. de protec. a la infancia **9**:592 (April) 1936.

The school must fulfil its chief end: to provide an efficient preparation for life. The diversity of types among children attending school calls for scientific classification of the children in order to give each child an education adapted to his personality; this if the children of today are to become the useful men of the future. A suitable classification implies not only pedagogic tests but also medical and psychophysiologic examinations; by these means only will it be possible to adapt the individual type to the type of work. The diversity of types calls for educational differences; hence, the need for establishing special schools and differential classes.

LESLIE, Evanston, Ill.

SOCIAL MEDICINE FOR CHILDREN (MONTEVIDEO). R. BERRO, Bol. Inst. internac. am. de protec. a la infancia **9**:611 (April) 1936.

Starting with a definition of social medicine, Berro points out that the subject is nowhere so important as in pediatrics since it comprises the two chief elements of the familial social cell: the mother and the child.

In the first chapter he deals with antepartum hygiene, which includes the problem of heredity and that of eugenics, of such widespread extension nowadays. The difficulties of the study of heredity in human kind and of the modification of the biotype arise chiefly from the practical impossibilty of experimentation and from the fact that the human race gives only three generations in each century. In addition to organic heredity there exists social heredity, which is very definitely influenced by environment and education.

Eugenics should follow the child throughout his development, comprising hence the most complex problems. A typical example is the question of the birth rate in its qualitative and quantitative aspects.

Prenuptial examination as a matter of advice, not of obligation, is presented as satisfactorily practiced in Uruguay and regulated by the Children's Code.

Shelters are provided to keep the child with its mother when there is no family unit. Later the placing of children in families, with supervision, is preferable to institutional care.

LESLIE, Evanston, Ill.

INFANT MORTALITY. C. GIANELLI, Bol. Inst. internac. am. de protec. a la infancia **9**:643 (April) 1936.

Gianelli analyzes the conditions of a suburb of Montevideo, Uruguay, located on the side of a hill (El Cerro), where the mortality of infants is high. The greater number of persons in the suburb are day workers in freezing plants engaging up to 15,000 hands; among these are many mothers who have to leave their babies in the care of strangers in order to work.

The mortality rate for infants was 11.5 per cent in 1930; 15 per cent in 1931, with a very hot summer and a severe winter (many respiratory diseases); 12.7 per cent in 1932; 8.8 per cent in 1933; 10 per cent in 1934 (serious epidemics of measles and whooping cough); 8.8 per cent in 1935.

The contributing factors were found to be: bad living conditions, ignorance (40 per cent of the parents are illiterate), illegitimacy (30 per cent of the infants are illegitimate), poverty and low standards of hygiene.

LESLIE, Evanston, Ill.

THE GROWTH IMPULSE IN INFANCY. E. ZELTNER, Arch. f. Kinderh. **108**:95 (May 10) 1936.

The length of infants up to 14 days of age is practically the same as at birth. While length is less influenced by disturbances in development than is weight, it is only during the first three months that growth in length continues to be normal despite an insufficient gain in weight. The growth potential of premature infants is greater than that of full term infants, at least in those of good vitality.

The chest-head difference of new-born infants has a direct relation to the weight, i. e., the difference is greater the weaker the child. In the first three months the growth of the head is greater than that of the chest; after this, however, the rate of growth of the head becomes slower. A large chest-head difference is commonly thought to be a stigma in a new-born infant, but in general it is without significance in later development. However, a chest-head difference of 4 cm. or more in a full term new-born infant is often a sign of a weak constitution. While the development of the chest shows a close relation to the weight, this is not true of the development of the head.

The development of the panniculus adiposus naturally is closely related to the gain in weight. It begins to develop as early as the first month of life and has vital significance in the maintenance of temperature equilibrium. The abdominal fat reaches its highest point of development at 6 months. The ability to form fat is in general greater in girls than in boys.

CRANE, Chicago.

AN APPROACH TO THE PROBLEMS OF INFANT NUTRITION IN CHINA. B. S. PLATT, Chinese M. J. **50**:410 (April) 1936.

This communication comes from the division of clinical research of the Henry Lester Institute, Shanghai. Recently published figures on the expectancy of life in the families of Chinese farmers show that one fourth of a group of more than a hundred thousand persons died before the age of 2 years, and half of these had not attained the age of 1 year. The high mortality in the first month of life in all countries is usually due to fetal or neonatal occurrences. While diarrheal and respiratory diseases play a great part in infant mortality, Platt thinks that the suboptimal character of the diet plays the fundamental rôle, in that it reduces resistance to infection. Breast feeding is especially recommended in China, since cow's milk is not so available there as in western countries. The milk of other

animals, cereals, principally rice, and soy bean flour are discussed. Platt feels that cow's milk, modified if necessary and supplemented by foods that contain the necessary vitamins, should be the feeding of choice in China when infants cannot have the advantage of breast feeding.

NEFF, Kansas City, Mo.

## Prematurity and Congenital Deformities

ASSOCIATION OF ECTOPIA LENTIS WITH ARACHNODACTYLIA. F. E. BURCH, Arch. Ophth. **15**:645 (April) 1936.

The relationship between arachnodactylia and ocular defects has not been recognized by American ophthalmologists. Pediatricians and orthopedists have been interested in arachnodactylia because it is so often seen in children. There is a hereditary or familial origin for both arachnodactylia and ocular defects, although either condition may be found without such a relationship.

Bilateral dislocation of the lens, complete or incomplete, is the most common ocular finding. The dislocation may be in any direction and of any degree. All the other ocular symptoms — myopia, hyperopia, miosis and iridodonesis — are dependent on, or associated with, ectopia lentis.

WESCOTT, Chicago.

TRANSPOSITION OF VISCERA, WITH REPORT OF A CASE OF COMPLETE TRANSPOSITION. F. CUNHA, M. Rec. **143**:276 (April 1) 1936.

Transposition of the viscera was first recorded by Aristotle. He reported two cases that he had observed in animals. In 1606 Fabricius reported a case in man, and in 1897 a case was diagnosed roentgenologically for the first time, after which many cases were recognized and reported. No definite etiologic factor has ever been demonstrated. Cunha gives a classification of the forms and then reports a case in which there was complete tranposition of all organs. In concluding his paper he states (1) that transposition does not affect either health or longevity and (2) that in cases in which an operation for intra-abdominal disorder is in question, the possibility of anomalies in the pancreas, bile ducts and pancreatic ducts being associated with or causative of the symptoms should not be overlooked.

WILLIAMSON, New Orleans.

MANAGEMENT OF PREMATURE INFANTS. K. M. MASANI, M. Digest **3**:413 (Feb.) 1936.

Masani's brief article covers in an excellent fashion the chief problems in the management of premature infants. The advantages of human breast milk are emphasized, and suitable artificial formulas are suggested for feeding when human breast milk is not available. The importance of maintaining body temperature and of the avoidance of infection is especially well presented.

LESLIE, Evanston, Ill.

HEREDITARY LARGE PARIETAL FORAMINA. F. PARKES WEBER, Proc. Roy. Soc. Med. **29**:122 (Dec.) 1935.

Large parietal foramina were present in a boy of 5 years. The foramina were situated, one on each side of the sagittal suture, about 30 mm. from the lambdoid suture. This developmental abnormality has been fully discussed by D. M. Greig (Edinburgh M. J. **34**:629, 1927). In this case the large foramina were hereditary. The boy's mother and a sister of the mother suffered from a similar condition. This sister was a twin, but the other twin did not show the large foramina. The author concludes the case report with a discussion of this condition.

WILLIAMSON, New Orleans.

ARACHNODACTYLIA WITH CONGENITAL HEART DISEASE. A. C. FLEW, Proc. Roy. Soc. Med. **29**:497 (March) 1936.

The case reported occurred in a boy of 10, one of eleven healthy children of healthy parents. He was 4 feet 10 inches (147 cm.) tall and very thin. He had thin, tapering fingers and toes. One year previous to the report he complained of breathlessness and of being tired. At that time heart trouble was diagnosed.

The physical, ophthalmologic, roentgen and other investigations are fully given in the report.

WILLIAMSON, New Orleans.

ULCEROUS AMNIOTIC DISEASE IN EVOLUTION. L. OMBRÉDANNE and J. LANGERON, Arch. de méd. d. enf. **39**:228 (April) 1936.

These authorities in clinical pediatrics have frequently opposed the traditional belief that mechanical action by amniotic bands is responsible for congenital fissures and amputations.

Though such bands are observed, they are obviously filaments from adhesions and are quite incapable of producing the serious lesions in question; the spiral grooves found in the tissues and the site of election on the fingers and toes cannot be harmonized with any mechanical hypothesis.

Further, analogies may be drawn from fissures of the tongue and from extensive cicatrices of the forehead, cheek, mouth and ear as well as from the macules and stigmas, more or less punctiform, which accompany congenital pseudarthroses or the partial loss of a long bone in the forearm or leg. Moreover, it would be inconceivable to attribute the types of syndactylism that are accompanied with scar formation to the action of intra-uterine bands rather than to the normal evolution of ulcerative processes which determines adhesions between the amnion and the embryo. The bands subsequently encountered are the result rather than the cause of the primary lesion, the latter having appeared before the essential elements of the skeletal framework were constituted.

TWO CASES OF CRANIOFACIAL DYSOSTOSIS. H. GRENET, Bull. Soc. de pédiat. de Paris **34**:156 (March) 1936.

A girl 6 years old and a girl 3½ years old presented some of the abnormalities characteristic of craniofacial dysostosis. The former had no family history of cranial deformity; the latter's mother and a brother who died at the age of 1 month had some cranial abnormalities.

BENJAMIN, Montreal, Canada.

NANISM WITH INFANTILISM, MICROCEPHALY AND OSSEOUS AND CUTANEOUS MALFORMATIONS OF THE TYPE OF SENILE NANISM OR PROGERIA IN TWO BROTHERS. G. HEUYER, L. DENOYELLE and A. BERNARD, Bull. Soc. de pédiat. de Paris **34**:159 (March) 1936.

Two brothers 14 and 12 years old, respectively, showed definite infantilism accompanied by some of the features which have been described in progeria. For want of any better category in which to place these two cases, they have been listed under the heading of progeria, although many of the characteristics of this condition were absent.

BENJAMIN, Montreal, Canada.

CONGENITAL HYPERTROPHY OF A LIMB. A. MARTIN, DESPLAS and R. DUCROQUET, Bull. Soc. de pédiat. de Paris **34**:170 (March) 1936.

A girl 4 months old had marked hypertrophy of the right lower extremity, most marked in the foot and becoming less all the way up, involving the right buttock and labium majus slightly. Syndactylia of the second, third and fourth toes was present. A photograph and roentgenograms demonstrate the condition.

BENJAMIN, Montreal, Canada.

MACRODACTYLIA. LOUIS DAMBRIN, Rev. d'orthop. **23**:215 (May) 1936.

Macrodactylia is a true hypertrophy. The most frequent site is the middle finger, the middle finger, the index finger, the thumb and the ring finger being affected in the order named. In the ring finger macrodactylia is exceptional and always occurs in conjunction with that of other fingers. The lesion is congenital but not familial or hereditary. The pathology and etiology are unknown. Clinically the disorder is benign. Treatment, if the finger becomes painful or causes inconvenience, is surgical removal.

RYAN, Vancouver, Canada.

CONGENITAL BILATERAL FLEXION CONTRACTURE OF THE THUMBS. H. REGELE, München. med. Wchnschr. **83**:391 (March 6) 1936.

The author reports two cases of an unusual condition, namely, congenital bilateral flexion contracture of the thumbs. One was in an 8 month old boy, and the other, in a 3½ year old boy. In both cases the parents noticed the tendency to hold the thumbs flexed shortly after birth. Passive extension was possible and painless. The thumbs were kept in extension with suitable appliances for four weeks. Thereafter active extension and flexion of the thumbs were possible and remained so during a follow-up observation period of three years.

BRAHDY, Mount Vernon, N. Y.

THE OPTIMAL TIME FOR THE SURGICAL CORRECTION OF CONGENITAL DEVELOPMENTAL DEFECTS IN INFANTS AND CHILDREN. J. PODLAHA, Bratisl. lekár. listy **15**:428 (March) 1935.

Podlaha discusses the optimal time and procedure for the surgical correction of such defects as harelip and cleft palate. He stresses the postoperative pallor and hyperpyrexia and recommends that when no emergency exists operations be carried out after stabilization of the circulation and of the metabolism. Harelip is operated on at about 8 weeks, and cleft palate, before the child begins to talk. A detailed schedule is outlined for the various degrees of cleft. Hemangioblastomas, esophageal strictures, hernias of the navel and of the spinal cord, anal atresias and other congenital defects are taken up.

STULIK, Chicago.

SOME DATA ON INFANTS REARED IN INCUBATORS. M. YPES, Maandschr. v. kindergeneesk. **5**:236 (March) 1936.

A thorough investigation was made into the fate of 173 infants taken into the Emma Children's Hospital in Amsterdam between 1920 and 1935 because of prematurity or a very low weight at birth. It is concluded from the figures that there is no definite relation between the period of pregnancy and the weight of the infant at birth, on one hand, and the further bodily and mental development of the infant, on the other. Often a retardation in development can be demonstrated only after a long time.

VAN CREVELD, Amsterdam, Netherlands.

## New-Born

POSITIVE AND PERMANENT IDENTIFICATION OF THE NEW-BORN. G. P. POND, Illinois M. J. **69**:327 (April) 1936.

In this article Pond, after enumerating the weaknesses in the use of footprints for the identification of infants, discusses in detail the use of prints of the palms. He describes a technic of obtaining satisfactory prints of the palms of new-born infants and lists the advantages of using this method. He believes that palm-prints may be of practical use not only for the positive identification of infants but for establishing mother-infant relationships.

BARBOUR, Peoria.

A Case of Meningitis in a New-Born Infant Due to a Slow Lactose-Fermenting Organism Belonging to the Colon Bacillus Group. M. E. Mulhern and Walter Bale Seelye, J. Lab. & Clin. Med. **21**:793 (May) 1936.

The author presents a case of meningitis in a 5 week old infant. The organism which was isolated from the spinal fluid resembled the organisms of the paratyphoid group, but there was no agglutination with specific agglutinating serums of this group. Fermentation tests placed the organism in the slow lactose-fermenting group of colon bacilli. The literature is reviewed. No other case has been proved to have been due to this organism. From the review of the literature one gathers the impression that some cases of meningitis that are thought to be due to paratyphoid bacilli may be due to the slow lactose-fermenting group of colon bacilli.

McMurray, Galveston, Texas.

Care of the New-Born. R. S. Eustis, New England J. Med. **214**:681 (April 2) 1936.

Eustis warns against overheating the hospital nursery, which increases the risk of respiratory infections and frequently causes indigestion and diarrhea. He recommends a temperature of 70 F. for the nursery and a temperature of from 75 to 80 F. for an adjoining treatment room.

In 1934, 83 per cent of the babies at the Boston Lying-in Hospital were breast fed. The remaining infants, even the premature ones, did well on a stock formula prepared as follows:

| | | Calories |
|---|---|---|
| Boiled milk | 12 ounces (355 cc.) | 240 |
| Karo | 1 ounce ( 30 cc.) | 120 |
| Water to make | 18 ounces (530 cc.) | — |
| | | 360 |

This formula supplies 20 calories to the ounce, i. e., as many calories as does the average breast milk. It can be made equally well with unsweetened evaporated milk, 6 instead of 12 ounces being used.

In intracranial hemorrhage, one treats for shock first and then gives an intravenous transfusion of from 1 to 2 ounces (from 30 to 60 cc.) of citrated whole blood. Lumbar puncture is performed after the infant has rallied from shock and preferably early in the stage of increased irritability, before convulsions develop.

Transfusion is the only really effective treatment for hemorrhagic disease of the new-born. Between 1 and 2 ounces of blood is withdrawn from the vein of one of the parents, mixed with citrate solution and injected into a scalp vein or one of the jugular veins of the infant. In cases of erythroblastosis, blood should be transfused at once and the transfusion repeated as often as is needed until the destruction of blood and the production of blood are normally balanced, which may be a matter of several weeks.

Mycotic stomatitis (thrush) is a recurring pest of hospital nurseries. The best results have been obtained by painting the tongue and the inside of the mouth with a 1 per cent aqueous solution of gentian violet. Two or three applications at daily intervals usually suffice.

For the prevention of impetigo a 2 per cent ammoniated mercury ointment is used immediately after the initial bath. The most effective treatment for denuded areas seems to be the use of drying lotions and exposure of the affected parts to the light of an ordinary electric light bulb.

Gengenbach, Denver.

Twins with Doubly Knotted Cords. Edward Frewer, Brit. M. J. **1**:159 (Jan. 25) 1936.

Frewer reports a case of this unusual anomaly.

Royster, University, Va.

SEVERE JAUNDICE WITH HEPATO-SPLENOMEGALY IN A CHILD AGED SEVEN DAYS. ERIC PRITCHARD, Proc. Roy. Soc. Med. **29**:218 (Jan.) 1936.

The patient was a baby of 7 days. Jaundice had been noted eight hours after birth. When the child was admitted to the hospital, the skin was olive-green. The liver and spleen were enlarged and hard. The stools were yellow, and the urine was deeply bile-stained. The temperature was 103 F. Two blood transfusions were given three days apart; mercury with chalk for six days and then calcium lactate were given. Iron and ammonium citrates was given later, until the baby was discharged from the hospital after two months, apparently well and gaining in weight.

The pathologic observations, including three blood counts, accompany the report.

WILLIAMSON, New Orleans.

NECESSITY OF EARLY TREATMENT OF ORTHOPEDIC DISORDERS OF THE NEW-BORN. M. LANCE, Gaz. d. hôp. **109**:652 (May 6) 1936.

While the surgical treatment must be postponed, the purely orthopedic treatment of congenital dislocation of the hip, obstetric paralysis of the arm, clubfoot and congenital rigidity of the joints gives the best result if begun after the first few days of life.

KAJDI, Baltimore.

THE INHERITANCE OF THE PARENTS' CONSTITUTION BY THE NEWLY BORN CHILD. A. M. RITALA, Acta Soc. med. fenn. duodecim **23**:1, 1935.

The length and weight of the body as well as the circumference of the head of the mother, the father and the new-born child were studied in an investigation, partly on the basis of information obtained from journal entries collected at the three largest lying-in hospitals in Finland and partly on the basis of measurements which were made by the author himself. Altogether, the material comprises 8,469 observations of the mother's absolute body measurements, and in all 12,860 body measurements of parents and new-born children were taken for the purpose of calculation of the correlation.

As regards the body measurement of the new-born child, its degree of dependency on the corresponding measurements of the mother and father is illustrated by the following correlation coefficients, calculated on the basis of the results arrived at from the records studied, from which round values are as follows:

| | | | |
|---|---|---|---|
| Circumference of head of mother | : | Circumference of head of child | r = 0.50 |
| Weight of mother | : | Weight of child | r = 0.25 to 0.60 |
| Length of mother | : | Length of child | r = 0.20 |
| Length of father | : | Length of child | r = 0.10 |
| Weight of father | : | Weight of child | r = 0.10 |
| Circumference of head of father | : | Circumference of head of child | r = 0.00 |

The weight and length of the new-born child proved to be considerably less dependent on the corresponding body measurements of the child's father (no group investigations have been previously undertaken on this subject) than on the corresponding body measurements of the mother. It is confirmed, however, by parallel findings in the investigated material that a positive correlation really exists in this respect.

Considering, furthermore, the body measurements of the mother and the new-born child, their dependency on each other is proved, not only by aid of the correlation calculation but also directly by classifying the mothers examined according to length and weight and then calculating the mean lengths and weights of the corresponding children's groups. A table was then made of the results arrived at with regard to the average length and weight of women from different parts of the world, and it was proved by information collected regarding the length and weight of new-born children from the same regions that an obvious conformity exists between these values.

Thus, the results attained emphasize the comparatively great importance of heredity in opposition to the influence of conditions of nourishment or, for example, the mother's age, to which too great importance has been attached. It is not possible to consider any influence on the new-born child due to the "social standing" or "habitation" of the mother until the constitutional factors have been excluded from the material investigated. Besides the inheritance of body measurement, the sex of the fetus and the number of the mother's deliveries have been proved to exercise a decided influence on the development of the new-born child.

In view of the interdependence with regard to the measurements—particularly to the circumference of the head—of the mother and the child born after full time pregnancy, a consideration of this feature seems advisable in determining the obstetric indication. Moreover, it is desirable to take the hereditary factor also into consideration when estimating medicolegally the degree of the new-born child's maturity as a criterion of duration of pregnancy. The mother's body structure also serves in practice as an important means of explaining the fetal rate of growth, which is often observed to fluctuate in different persons.

AUTHOR'S SUMMARY.

POSSIBILITY THAT THE FETUS IS ALIVE WHEN THE UMBILICAL CORD IS NONPULSATING. J. PEETERS, Nederl. tijdschr. v. geneesk. **80**:977 (March 7) 1936.

A case is reported in which at confinement the umbilical cord bulged out in such a way that the infant was considered to be dead. On extraction, however, the infant proved to be alive and was only slightly asphyctic. The author is of the opinion that the prognosis for the infant when there is a nonpulsating cord is not as unfavorable as is usually thought.

VAN CREVELD, Amsterdam, Netherlands.

GONOCOCCIC SEPSIS AND MENINGITIS IN BLENNORRHOEA NEONATORUM. J. C. BROEK and J. H. G. CARSTENS, Nederl. tijdschr. v. geneesk. **80**:1736 (April 18) 1936.

The authors describe a case of gonococcic conjunctivitis in a new-born infant, followed by gonococcic septicemia and meningitis, in which the presence of the gonococcus was proved by the morphologic, cultural and biochemical characters of the causative micro-organism and also by the agglutination and the complement-fixation test. In contrast to three similar cases of the disease previously described in the literature, recovery resulted in this case.

VAN CREVELD, Amsterdam, Netherlands.

## Acute Contagious Diseases

SCARLET FEVER OUTBREAK TRACED TO RAW MILK. Health News **13**:69 (May 4) 1936.

Seventy-two cases of scarlet fever and sore throat with one fatality occurred in Red Creek, N. Y., between Feb. 5 and March 3, 1936. Two thirds of the residents of this small town were supplied with raw milk from one dairy. The outbreak was traced to one cow with mild mastitis. Similar hemolytic streptococci were obtained from the cow, its milk and the throats of patients.

AIKMAN, Rochester, N. Y.

PURIFICATION AND CONCENTRATION OF DIPHTHERIA TOXIN: I. EVALUATION OF PREVIOUS METHODS; DESCRIPTION OF A NEW PROCEDURE. M. D. EATON, J. Bact. **31**:347 (April) 1936.

An investigation of the chemical nature of a bacterial toxin must await the isolation of the toxic substance in a state of relative purity. Eaton undertook

to isolate, in a pure state, diphtheria toxin, which up to the present time is the best known and most thoroughly studied of all the bacterial toxins.

In his report he first compares the various methods of purifying diphtheria toxin and emphasizes the objections to using acid in any of the procedures. He then describes a new method of purifying diphtheria toxin by precipitation with aluminum ammonium sulfate and cadmium chloride. By this method he has obtained purified toxin containing 0.0005 mg. of nitrogen per Lf unit and 0.00002 mg. of nitrogen per minimum lethal dose.

STOESSER, Minneapolis.

PURIFICATION AND CONCENTRATION OF DIPHTHERIA TOXIN: II. OBSERVATIONS ON THE NATURE OF THE TOXIN. M. D. EATON, J. Bact. **31**:367 (April) 1936.

In a previous paper, Eaton described a new method of purifying diphtheria toxin. He continued his experiments and made further modifications in his method. He found that with progressive purification the ratio of nitrogen to Lf units in preparations of diphtheria toxin appears to approach a constant value near 0.0005 mg. of nitrogen per Lf unit. None of the several processes so far used in purification yielded toxins with a lower nitrogen-Lf ratio.

The highly purified toxin consists mainly of a protein which is not easily precipitated with acid at any $p_H$ and which contains no cysteine sulfur and very little or no tryptophan. Traces of proteoses from the culture medium and of other proteins, probably derived from the bacterial cells, are also present. The chemical, immunologic and physiologic properties of diphtheria toxin point to its being a single protein-like substance.

STOESSER, Minneapolis.

FAILURE TO INFECT MONKEYS WITH POLIOMYELITIS VIRUS THROUGH ISOLATED INTESTINAL LOOPS. EDWIN H. LENNETTE and N. PAUL HUDSON, J. Infect. Dis. **58**:10 (Jan.-Feb.) 1936.

The author's summary is as follows: "Suspensions of poliomyelitic spinal cords of monkeys were instilled repeatedly into loops of isolated bowel in 4 M. rhesus without producing infection. Attempts to induce poliomyelitis in these animals by administering whole virus-cord were likewise negative, despite the comparatively huge dosage employed. Subsequent efforts were preceded by a preliminary washing out of the loops with phosphate buffer solution, $p_H$ 5.0, in an endeavor to increase the permeability of the intestinal mucosa. This method, found to be so useful in increasing the incidence of infection by the nasal route, was ineffective when applied to the bowel inasmuch as no evidence of infection was obtained.

"Thus, while virus in one form or another was administered intensively over a period of 3 months, no poliomyelitis occurred at any stage of this prolonged experiment.

"Neutralizing antibodies were not demonstrated in the serum 44 days after the last instillation of virus. Saline extracts of the isolated intestinal loops and of the regional lymph nodes draining them failed to inactivate the virus. The virus was not demonstrated in the two extracts tested.

"We were unable to find experimental evidence that the poliomyelitis virus invades M. rhesus by the intestinal route, when large amounts of virus were applied to normal mucosa over long periods of time in the absence of the usual intestinal contents."

TOOMEY, Cleveland.

DEVELOPMENT OF NEUTRALIZING SUBSTANCE FOR POLIOMYELITIS VIRUS IN VACCINATED AND UNVACCINATED INDIVIDUALS. W. L. AYCOCK and C. C. HUDSON, New England J. Med. **214**:715 (April 9) 1936.

Tests to determine whether a neutralizing substance was produced by two vaccines in use against poliomyelitis in North Carolina were done on the blood of twenty-eight persons before and after vaccination. It was found that 46.4

per cent of the group were already immune; after vaccination, 75 per cent of the group showed neutralization of the virus, an increase of 28.6 per cent.

Neutralization tests on thirty-five persons as controls showed 40 per cent immune on the first bleeding and 62.8 per cent on the later bleeding, an increase of 22.8 per cent.

Since an increase occurred in both the vaccinated and the control group, it seems reasonable to infer that it was due, in large part at least, to natural exposure. The occurrence of eight cases of poliomyelitis in the city in which the study was made during the period in which it was made bears witness to the prevalence of the virus.

GENGENBACH, Denver.

DOES MODIFIED MEASLES CONFER LASTING IMMUNITY? J. H. TOWNSEND, New England J. Med. **214**:732 (April 9) 1936.

On the outbreak of an epidemic of sixty-five cases of measles in a boarding school, in February 1926, thirty-two students received 9 cc. of convalescent whole blood at least eight days before the development of the rash and experienced distinctly milder symptoms than their fellows who were not so treated. Replies from these thirty-two persons who ten years ago had modified measles indicate that none of them has experienced a subsequent attack of measles although many of them are known to have been amply exposed.

GENGENBACH, Denver.

A HOSPITAL EPIDEMIC OF DIPHTHERIA. J. E. PERKINS, New York State J. Med. **36**:614 (April 15) 1936.

An outbreak of twenty cases of diphtheria in a hospital of 125 beds is reported. Eighteen of the cases were among the personnel, and fourteen of these eighteen were among the nurses. The youngest patient was 18 years of age. Forty-six carriers were detected. Ten of the twenty patients claimed to have had negative results from the Schick test; this claim was confirmed on seven of them. Ten of the twenty had also received injections of toxoid or of toxin-antitoxin.

"The occurrence of such an epidemic among adults, particularly among members of a group with a high percentage giving a history of active or recent passive immunization and negative Schick tests, is rare, and suggests that either a mixed infection was present or that a strain of diphtheria bacilli having unusual characteristics was responsible for the outbreak."

AIKMAN, Rochester, N. Y.

THE USE OF HUMAN CONVALESCENT SERUM IN INFECTIOUS DISEASES. MAURICE HARDGROVE, Wisconsin M. J. **34**:812 (Nov.) 1935.

The use of convalescent serum has been restricted because of the difficulty of procuring an adequate supply of serum prepared in a satisfactory manner. Authorized serum depots are a recent development. There has been one in Detroit under the supervision of the city health department for ten years; one at the Michael Reese Hospital of Chicago for five years and one at Columbia Hospital in Milwaukee for one year.

The organization and operation of the latter is described, as are the preparation and storage of the pooled serum from convalescent persons. Convalescent scarlet fever and measles serums are the most used, but some serum has been used for mumps and other infections. The dosage both as to prophylaxis and for therapeutic use is discussed and ranges between 5 and 80 cc., depending on age, duration of exposure when given, severity of illness, etc. For over 800 vials used there were six so-called reactions, 2 persons had mild urticaria three weeks after receiving the serum, and 4 had a rise of temperature immediately after the serum was given, which calls attention to the fact that certain precautions should be taken (warm serum, chemically clean syringes, etc.) in its administration.

Among 114 persons who had been in contact with patients with scarlet fever and who were given the scarlet fever immune serum (mostly between the fourth

and the fifth day after exposure) none acquired scarlet fever during the first fourteen day period. Two had mild attacks after one month and 2 after six weeks.

Among 69 patients with scarlet fever given the serum therapeutically, there was noticeable improvement in all but 2, and striking improvement in 50 in from one to twelve hours after its administration.

In measles prophylaxis among 47 persons given the serum, 29 had the recommended dose and only 3 acquired measles (mild to moderate), while among 18 given less than the advised dose 9 had a mild attack and 1 had a moderate attack.

JANNEY, Wauwatosa, Wis.

THE DIAGNOSIS OF DOUBTFUL CASES OF SCARLET FEVER. W. A. BROWN and V. D. ALLISON, Brit. M. J. **2**:1249 (Dec. 28) 1935.

The author's summary is as follows:

"Many patients, especially during epidemic periods, are sent into hospital certified as suffering from scarlet fever, and their clinical condition on admission gives rise to doubt as to the accuracy of the diagnosis.

"A considerable number of these patients, clinically doubtful on admission, might be discharged with safety within a few days as the result of negative bacteriologic findings.

"The presence or absence of haemolytic streptococci in swabs from the nose, throat, septic wounds, burns, etc., in a patient with a scarlatiniform rash will, in many cases, be of valuable assistance in arriving at a correct diagnosis, and it is suggested that a bacteriological examination of such swabs might with advantage be made in any case in which the clinical diagnosis is doubtful.

"Reference is made to the special technique required in bacteriological work of this kind."

ROYSTER, University, Va.

THE DIPHTHERIA TOXOID-REACTION (MOLONEY) TEST: ITS APPLICATIONS AND SIGNIFICANCE. E. ASHWORTH UNDERWOOD, J. Hyg. **35**:449 (Dec.) 1935.

The intradermal injection of diluted (0.2 cc. of a 1:200 dilution) toxoid should be used as a test to ascertain which are "potential toxoid reactors," before giving the prophylactic dose of toxoid to older children. A description of the test and various standards for its interpretation are given. Results from Moloney tests on 2,666 children tested before immunization and on 595 tested afterward indicate the following:

A small percentage (3 or less) of children under 5 years old give a 2 plus or a 3 plus reaction. At 7 years 9.6 per cent are reactors, and at 14 the maximum, 43.3 per cent, is reached. The increase in percentage of reactors is not a steady curve but has periods of rapidly increased rate corresponding to opportunities for contact with and sensitization to Corynebacterium diphtheriae (usually greatest the second year and especially about the fifth year when the child enters school).

Those who have a 2 plus or a 3 plus reaction are likely to acquire symptoms when given toxoid in prophylactic doses. The 3 plus reactors (erythema area 40 mm. or more in diameter with a central area of induration) should not be given toxoid at all, while the 2 plus reactors should have fractional doses. Not all of either of these groups, however, necessarily suffer bad effects from the treatment.

The state of giving a positive reaction to the Moloney test and that of giving a negative reaction to the Schick test are not identical, although it often and naturally indicates some degree of immunity. The Moloney test and the Schick control test cannot be used as substitutes for each other, but the Moloney test is more important and hence often replaces the Schick control test when it is given at the same time that the primary Schick test is given.

All children of school age should be given this test before the use of toxoid.

JANNEY, Wauwatosa, Wis.

THE PSEUDO-SCHICK REACTION AND THE INTRADERMAL TOXOID TEST OF MOLONEY: THEIR RELATIONSHIP AND SIGNIFICANCE. MAURICE MITMAN, J. Hyg. **35**: 512 (Dec.) 1935.

This work gives a detailed consideration and comparison of the development, theories and use of the Schick test, the Schick control test and the toxoid reactor test of Moloney and gives the conclusion reached in comparing the latter two tests on 212 student nurses with immunization of those giving a positive reaction to the Schick test, both tests being done along with the Schick test, both before and after immunization with toxoid.

It was found that the toxoid reactor test corresponds exactly to the pseudo-response in the Schick test. The pseudoresponse, or Schick control test, is as efficient as the reactor test on detecting reactors and is more accurate as a control of the Schick test; hence makes the reactor test of Moloney superfluous. A positive reaction to either accurately indicates those who will react to immunization, but a negative reaction is no guarantee that the subject will not react. The reaction of both is evidence of bacterial hypersensitiveness to specific products of the diphtheria bacillus.

Zoeller's theory that hypersensitiveness is a half-way stage between susceptibility and immunity is incorrect. Both tests usually, but not always, show parallelism with the development of immunity and so give some information about immunity.

JANNEY, Wauwatosa, Wis.

ANTI-DIPHTHERIA INOCULATION: DELAYED REACTIONS IN PRELIMINARY TESTING. C. R. MERRILLEES, M. J. Australia **1**:503 (April 1) 1936.

Although the local reaction due to hypersensitivity to anatoxin prepared with solution of formaldehyde U. S. P. usually appears in twenty-four hours after the application of the test, it occasionally is delayed until about the end of the third day. This delayed reaction "is usually large, 2.5 to 4.0 centimeters, with a raised shiny surface. Its colour is an irregular mottled red and is well described by the children as 'underdone' steak. It fades slowly and leaves a bruised-looking patch that persists for a fortnight or more." It probably occurs not less often than once in each thousand cases, but in order to avoid severe reactions to anatoxin when mass inoculation of children is being done, four or five days should be permitted to elapse after the intradermal test before the administration of the first prophylactic dose.

GONCE, Madison, Wis.

NERVOUS COMPLICATIONS OF MEASLES. New Zealand M. J. **35**:101 (April) 1936.

Five cases of acute disseminated encephalomyelitis occurring in association with measles are reported—three in adults and two in children. In one of the children, a girl of 3 years, the rash appeared on the twenty-fourth day of the illness, but two other members of the family had measles at the outset. All showed cerebral symptoms in addition to measles. All had changes in the cerebrospinal fluid, the cell counts varying from 9 to 550; globulin, from 0 to 2+; chloride, from 0.70 to 0.78 per cent; sugar, from 0.06 to 0.09 per cent, and total proteins, from 0.02 to 0.09 per cent. These cases seemed to occur during an epidemic of measles. That such an epidemic had occurred was gleaned from the registrar's report of "discharges and deaths," for measles is not a reportable disease in New Zealand. However, during a similar epidemic several years previously, no cases were seen. In reply to inquiries eighteen months after their illness, two patients stated that they were perfectly well. One patient was lost sight of. One patient showed, two years later, a definite dulling of sensation to pinprick below the third dorsal nerve on the right side and below the fifth on the left side, absence of the abdominal reflexes on the right side and a tendency to stand with slightly flexed knees. One patient on examination two years later seemed to show only emotional changes as residue.

MULHERIN, Augusta, Ga.

EPIDEMIC CEREBROSPINAL MENINGITIS. H. MADISSOON, Arch. de méd. d. enf. **39**:233 (April) 1936.

Fatal meningococcic meningitis in a boy of 5 months is reported in detail.

AMESSE, Denver.

STRYCHNINE THERAPY IN MALIGNANT DIPHTHERIA. V. G., Progrès méd., May 30, 1936, p. 922.

The author feels that the mortality in malignant diphtheria may be reduced considerably by the use of strychnine in appropriate doses. In infants up to 1½ years 1 mg. is given per day. This may be increased to 3 mg. as the age increases to 5 or 6 years. The dose for adults is considerably more, varying with the severity of the infection.

LESLIE, Evanston, Ill.

DISEASE OF HEINE-MEDIN IN THE PROVINCE OF AREZZO IN 1932. E. NUCCI, Riv. di clin. pediat. **34**:412 (May) 1936.

Nucci has analyzed thirty cases of acute anterior poliomyelitis with paralysis which occurred in the province of Arezzo in Italy from May to October 1932. The age distribution was as follows: Four patients were less than 1 year old, thirteen were from 1 to 2 years old, ten were from 3 to 6 years old and three were from 8 to 9 years old.

HIGGINS, Boston.

RESULTS OF ANTIDIPHTHERITIC IMMUNIZATION WITH THE NEW TECHNIC OF RAMON. VICTOR ZERBINO, Arch. de pediat. d. Uruguay **7**:5 (Jan.) 1936.

The new technic of Ramon and Debré consists in giving only two injections of 1 or 2 cc. of toxoid of an antigenic value of 20 units per cubic centimeter. The injections are given at intervals of three months. In forty-seven of fifty-two children in whom the reaction to the Schick test was positive, it became negative after the second injection. A third dose resulted in a negative Schick reaction in the remaining cases. Zerbino feels that this is a better percentage than can be obtained with any other method now in use.

SCHLUTZ, Chicago.

FATAL REACTIONS TO SERUM OCCURRING IN THE FIRST QUARTER OF AN HOUR. F. J. DA SILVEIRA LOBO JR., J. de pediat., Rio de Janeiro **3**:3 (Jan.) 1936.

Five cubic centimeters of polyvalent antidysentery serum was injected subcutaneously into the lumbar region of a 1 year old child suffering from dysentery. The child also had an exudative diathesis. Death occurred in fifteen minutes. This calamity caused the author to review the literature. He concludes that fortunately such cases are rare. There is no particular precaution that is of any avail. Strangely, the condition in many fatal cases was of the exudative diathesis type.

SANFORD, Chicago.

A TWO YEARS' STUDY OF PERTUSSIS. OLIVIO AHUMADA LEMUS, Rev. chilena de pediat. **6**:556 (Nov.) 1935.

Ahumada Lemus doubts whether a real preventive or curative treatment exists for pertussis. The results he obtained with vaccine therapy were not impressive and certainly not conclusive.

Many of the stock pharmaceutical preparations are absolutely ineffective. Some produce severe reactions, and a few are even toxic.

Protein therapy in the form of injections of whole blood seemed to be of some advantage.

SCHLUTZ, Chicago.

ELECTROCARDIOGRAPHIC OBSERVATIONS IN DIPHTHERIA. G. W. PARADE and H. PETERSEN, Jahrb. f. Kinderh. **145**:22 (July) 1935.

Electrocardiographic studies were made on sixty children ill with diphtheria. Transient alterations in the electrocardiogram were noted as well as those of a more serious nature including severe deformities of the QRS complex and bundle branch block.

Complete recovery may take place, even from the severe type of involvement as shown by the electrocardiogram.

Fatal embolism may occur after apparent restoration of a normal cardiac rhythm.

Slight permanent changes may occur in the QRS complex as a result of the diphtheritic changes.

LANDAU, Hannibal, Mo.

DIPHTHERIA AND INCREASED BLOOD PRESSURE. W. CATEL, Monatschr. f. Kinderh. **64**:372, 1936.

Catel studied the blood pressure of 215 children over 7 years of age after infection with diphtheria. In 7 per cent there was a persistent elevation of the blood pressure over normal. In none could a diagnosis of nephritis be established. He discusses the various causes of hypertension and suggests that in these cases there may have been some undiagnosed damage to the blood vessels of the kidney. Had these children not been studied, a diagnosis of essential hypertension would have been made. He uses these results to raise the question as to whether there is such an entity as essential hypertension.

GERSTLEY, Chicago.

THE EFFECT OF VITAMIN C ON EXPERIMENTAL CONJUNCTIVAL DIPHTHERIA. HARALD BOCK and HELMUT GROSSMANN, Monatschr. f. Kinderh. **65**:35, 1936.

Bock and Grossmann confirm observations on the virulence of diphtheria of the mucous membranes in experimentally produced avitaminosis C. Guinea-pigs which received a daily dose of from 10 to 30 mg. of cevitamic acid showed much milder symptoms than those on normal diets without the addition of vitamin C. With larger doses of vitamin C the resistance against diphtheria seemed less affected. The writers do not know whether this diminution of resistance can be on the basis of hypervitaminosis or due to an unfavorable season. The best weight curve was obtained with the vitamin in doses of 10 to 30 mg.

GERSTLEY, Chicago.

CONJUNCTIVITIS IN SCARLET FEVER. HANS OTTO, München. med. Wchnschr. **82**:1987 (Dec. 13) 1935.

Otto observed 891 cases of scarlet fever during a 9 year period and noted the presence of conjunctivitis in 52. Usually it occurred early in the illness, but in some instances it occurred as late as seven weeks after the onset. The severity of the conjunctivitis varied from mild attacks of two days' duration to those in which the condition persisted for three weeks. The author considers it an allergic manifestation.

BRAHDY, Mount Vernon, N. Y.

PURULENT MENINGITIS IN SCARLET FEVER. H. ZISCHINSKY, München. med. Wchnschr. **82**:2028 (Dec. 20) 1935.

Purulent meningitis is an infrequent complication of scarlet fever. Zischinsky observed it nine times in 26,000 cases of scarlet fever. The infection may spread to the meninges from the ear or the nasal sinuses. In addition, there is primary or metastatic meningitis. The presence of otitis media does not necessarily mean that the meningitis results from the aural infection. Zischinsky expresses the belief that the metastatic meningitis is the more frequent type.

BRAHDY, Mount Vernon, N. Y.

USE OF PLACENTAL EXTRACT IN PROPHYLAXIS AGAINST MEASLES. G. PASCHLAU München. med. Wchnschr. **83**:564 (April 3) 1936.

The use of convalescent serum in prophylaxis against measles has been successful, but the serum is not readily available. Adult whole blood is also an effective prophylactic agent. However, large quantities are necessary, and in Paschlau's experience adult whole blood is inconvenient to use in private practice because the administration requires sterile glass ware, sterile sodium citrate solution and the help of an assistant. He investigated the value of a placental extract as a prophylactic agent. He used the extract, prepared according to the method of McKhann and Chu, in twenty-two children in an orphan asylum. The children were given 5 cc. on the fourth or fifth day of the period of incubation. In eight children measles did not develop. Fourteen children were not protected. Because these results were not satisfactory, larger doses of the extract were tried, but fever, local pain and collapse ensued.

To avoid these undesirable reactions a purified extract was prepared. The pressor amines, such as tyramine and amylamine, as well as histamine, were removed. The resultant purified (globulin) extract was water clear and stable, and the protein content was constant. There were no reactions when this extract was used in doses of 10 or 15 cc.

Seventy-four children received from 5 to 15 cc. of the purified extract on the fourth or fifth day of the period of incubation. In half of them measles developed, but in several of these the disease was of a mild or modified type. The protection was higher (55 per cent) in those children who received 10 cc. (one received 15 cc.) of the extract than in those who received the smaller dose (45 per cent). One child died of complicating pneumonia. The period of incubation was frequently prolonged.

The extract should be used prophylactically in children between 4 months and 5 years of age as well as in older children whose resistance is low.

BRAHDY, Mount Vernon, N. Y.

SHORT WAVE RADIATION FOR WHOOPING COUGH. K. R. VON ROQUES, München. med. Wchnschr. **83**:680 (April 24) 1936.

Von Roques tried short wave therapy in seventeen children suffering from whooping cough with the typical paroxysms. The treatment was given daily for from ten to fifteen minutes until the paroxysms stopped. The residual bronchitis which prolonged the coughing in some of the patients did not require treatment. Most of the patients were treated for from six to ten days; the average for the entire series was eight and two-fifths days. The author has no explanation for the efficacy of the short wave therapy.

BRAHDY, Mount Vernon, N. Y.

PLACENTAL EXTRACT IN MODIFICATION OF MEASLES. F. T. CHU and C. Y. CHOU, Chinese M. J. **50**:297 (April) 1936.

Chu and Chou in 1935 published pediatric and biochemical observations which they had made at Peiping Union Medical College *(Proc. Soc. Exper. Biol. & Med.* **33**:323 [Dec.] 1935). They now report their results from the practical use of dry placental extracts in twenty-two children exposed to measles. Fourteen of these showed modified measles, three underwent atypical attacks without modification, and five showed no signs of the disease during the following four weeks of observation.

The extract used is precipitated by means of methyl alcohol, which is a shorter process and free from any chance of contamination. The dry product is redissolved and given intramuscularly.

Nonimmune children who have been intimately exposed are given the extract on the fourth or fifth day in a dose of from 0.02 to 0.025 Gm. per kilogram of body weight.

NEFF, Kansas City, Mo.

SCARLET FEVER IN CANTON. K. L. HSÜ, Chinese M. J. **50**:405 (April) 1936.

Scarlet fever is uncommon in southern China. The Dick test was made on school children as well as on the doctors and nurses of the Canton Hospital. Among 1,437 persons tested, 26 reacted positively. A similar low proportion was noted in Hongkong. In other parts of China positive reactors are much more common. Hsü believes that the relative infrequency in his part of China is due to the active immunity resulting from mild or unrecognized infections in children in the school period of life.

NEFF, Kansas City, Mo.

CEREBRO-SPINAL MENINGITIS IN MOUKDEN. Y. E. KAO, Chinese M. J. **50**:478 (April) 1936.

Kao states that cerebrospinal meningitis is a disease of growing importance in the Far East. He reports fifty cases, fifteen of which were in children under 1 year of age and one in an infant of 2 months. Most of the patients were brought into the hospital when the disease was in a late stage, because of the distance from the hospital. He discusses the diagnostic findings, the mortality and the general treatment. Antimeningococcic serum was used in the spinal canal, and in severe cases it was given intravenously and intramuscularly. The mortality rate was 44 per cent.

NEFF, Kansas City, Mo.

MENINGOCOCCUS MENINGITIS IN CHILDREN. T. F. SU, Chinese M. J. **50**:491 (April) 1936.

This is a report of an epidemic in Changsha, in the province of Hunan, China, in the year 1935. The writer belongs to the division of pediatrics in the medical college of Changsha. Among the 150 patients admitted to the hospital were fifty-six children under 12 years of age. Su summarizes the clinical picture as observed in infants and children. On admission, about a third of these children were mentally clear, another third were quite drowsy, and the remainder were comatose. There were changes of the sensorium, muscular rigidity, alterations in the reflexes, bulging of the fontanel, convulsions and ocular symptoms. Six of the children presented fulminating disease, dying in one or two days after the onset. In five cases the condition was of the masked type and the diagnosis might have been missed if the disease had been sporadic. Severe iridochoroiditis resulted in these instances.

About 54 per cent were discharged well, and 7 per cent, improved. The mortality rate was 28.5 per cent.

NEFF, Kansas City, Mo.

## Acute Infectious Diseases

THE TREATMENT OF AMOEBIASIS WITH IODOXYQUINOLIN SULPHONIC ACID. F. W. O'CONNOR and C. R. HULSE, Am. J. Digest. Dis. & Nutrition **2**:568 (Nov.) 1935.

One hundred and fifty-two persons with amebiasis (intestinal) were treated with iodoxyquinoline sulfonic acid. It was found to be effective in all cases in which the condition was not complicated by abscess of the liver. In cases of abscess of the liver emetine hydrochloride is given hypodermically in conjunction with iodoxyquinoline sulfonic acid. The dose for adults is 4 pills three times a day for eight days, or 96 pills.

It is interesting that in ninety-five uncomplicated cases of intestinal amebiasis an uninterrupted recovery followed and that the stools remained free from Endamoeba histolytica for five years.

MORRISON, Savannah, Ga.

LESIONS IN THE AURICULOVENTRICULAR CONDUCTION SYSTEM OCCURRING IN RHEUMATIC FEVER. L. GROSS and B. M. FRIED, Am. J. Path. **12**:31 (Jan.) 1936.

Gross and Fried examined 110 human hearts in order to determine the nature and the frequency of the lesions occurring in the atrioventricular node and bundle of His in rheumatic fever; 60 of these hearts represented persons in whom rheumatic fever was active; 25, persons in whom it was inactive. The remaining 25 hearts were from persons who did not have rheumatic fever. The authors show that in active rheumatic fever there occur various inflammatory and vascular phenomena within the horizontal conduction system as well as in the surrounding tissue. Even when studied in few representative specimens from each bundle, the incidence of these lesions in the "active" material was approximately 66 per cent. It is highly probable that a study of more sections would have indicated a higher incidence. Very few of these lesions were of a specific or highly characteristic nature. The hearts from persons in whom rheumatic fever was inactive showed few pathologic changes. This is in keeping with the functional differences observed between these two groups. Attention is called to the high incidence of inflammatory lesions in the collagenous extension of the septum fibrosum, and the possible mechanisms concerned in the spread of the rheumatic infection to the bundle of His are discussed. The topographic relations of the horizontal conduction system in the human heart are described, and the findings in 25 nonrheumatic hearts as controls are given.

MOORE, New York.

THE DIAGNOSIS OF GONOCOCCIC INFECTIONS BY THE CULTURAL METHOD. A. D. LEAHY and C. M. CARPENTER, Am. J. Syph., Gonor. & Ven. Dis. **20**:347, 1936.

A modification of McLeod's cultural method for the diagnosis of gonococcic infections is described. The method consists in making cultures on chocolate agar prepared with a Douglas agar base and incubating them at 34 C. in an atmosphere of air reenforced to approximately 10 per cent in its carbon dioxide content. The oxidase test, with use of a 1 per cent aqueous solution of dimethyl-paraphenylenediamine hydrochloride, is used to identify colonies of the gonococcus in mixed cultures.

By this technic 130 cultures of the gonococcus were isolated, representing 43 per cent of the 302 specimens submitted for examination from 138 patients. The use of the cultural method described resulted in the discovery of 10 per cent more cases of gonococcic infection than were discovered by the smear method alone. This percentage is much higher when only specimens from the lower part of the birth canal and from prostatic secretions are considered.

The incubation of cultures in an atmosphere of air reenforced to approximately 10 per cent in its carbon dioxide content resulted in the isolation of 15 per cent more cultures of gonococci than were recovered from duplicate cultures incubated in air under conditions that were otherwise identical.

The use of the oxydase test detected 21 (14 per cent) of 146 cultures of the gonococcus that would have been reported negative had direct inspection alone been relied on.

ROYSTER, University, Va.

THE MERITS OF BLOOD TRANSFUSION IN SEPTICEMIA. FREDERICK STENN, Illinois M. J. **69**:65 (Jan.) 1936.

After a review of the literature and a case report Stenn concludes that blood transfusion is a valuable therapeutic measure in septicemia. He expresses the belief that it is best given intravenously early in the disease every forty-eight hours in adequate amounts until clinical improvement is detectable.

BARBOUR, Peoria, Ill.

GAS GANGRENE IN A CHILD. L. A. RIDDELL, Brit. M. J. **1**:159 (Jan. 25) 1936.

Riddell reports a case of gas gangrene.

ROYSTER, University, Va.

THE EFFECT OF EARLY TONSILLECTOMY ON THE INCIDENCE OF ACUTE RHEUMATISM. H. L. WALLACE and A. BROWNLIE SMITH, Edinburgh M. J. **43**:452 (July) 1936.

Wallace and Smith differ with two earlier authors from Scotland who had concluded that early tonsillectomy may prevent the first attack of rheumatism as well as recurrence. The present report concerns two groups of children, 403 of whom underwent tonsillectomy before the age of 5 years, 7.2 per cent suffering later from chorea, rheumatic fever or carditis before leaving school; rheumatism occurred in 4.2 per cent of the 574 children whose tonsils were removed during the later years of childhood. Scarlet fever later developed with about the same frequency—14.4 per cent in group 1 and 16 per cent in group 2. Tonsillectomy performed at an early age either fails to protect against rheumatism or makes the child more likely to acquire it.

NEFF, Kansas City, Mo.

JUVENILE RHEUMATISM AND THE PREVENTION OF HEART DISEASE. C. J. MCSWEENEY, Irish J. M. Sc., April 1936, p. 158.

McSweeney quotes figures on the deaths from rheumatic fever and on the sequelae of this disease in Ireland, especially in Dublin. He emphasizes the cardiac aspect of the disease. He stresses follow-up and supervision of patients suspected of having and known to have cardiac disease. He stresses hospital treatment of the patients. In a series of 598 patients with rheumatism, on admission 31 had normal hearts, 492 had evidence of myocarditis and possibly of valvular disease, and 75 appeared to have definite valvular disease. On discharge after from ten to twelve weeks in the hospital, 376 had normal hearts, 154 were in the middle group, and 68 had a definite cardiac murmur. The rate of recurrence of rheumatic manifestations was 22.6 per cent in the group with chorea and 9.6 per cent in the nonchoreic group.

SNELLING, Toronto, Canada.

OBSERVATIONS ON THE TREATMENT OF TETANUS. E. T. FREEMAN, Irish J. M. Sc., April 1936, p. 166.

Freeman advocates the use of phenobarbital to relieve patients from spasms and pain. It is given hypodermically. Tribromethanol in amylene hydrate has been used and seems to be effective. The dose of serum is from 160,000 to 200,000 units, injected intramuscularly and intravenously. The patients are fed dextrose.

SNELLING, Toronto, Canada.

ON CERTAIN SEPTICAEMIAS DUE TO ANAEROBIC ORGANISMS. A. LEMIERRE, Lancet **1**:701 (March 28) 1936.

Whatever their primary focus, the septicemias produced by the anaerobic organisms which occur as saprophytes in the natural cavities of the human body display remarkable clinical similarities. They commence with suppuration in the local site, followed by local thrombophlebitis. Considerable fever and intense rigors are the next features, and these are followed frequently by the development of septic pulmonary emboli. The syndrome is so characteristic that it permits of diagnosis before bacteriologic examination, including culture of the blood, has provided conclusive proof. The postanginal septicemias due to Bacillus funduliformis are specially described, but the same phenomena are observed when septicemias of anaerobic origin arise from other initial causes.

LANGMANN, New York.

AGGLUTININS FOR DYSENTERY BACILLI. Z. TEVELI, Arch. f. Kinderh. **108**:1 (April 28) 1936.

Teveli reports that 450 agglutination determinations carried out on the serums of infants, children and adults show that in Hungary at the present time the

serums of well persons usually agglutinate, even in high dilution, the H and B types belonging to the Flexner Y groups of dysentery bacilli. Agglutination of the other types of the Flexner groups by normal serum is significantly less frequent and of slighter degree. Since the agents in the endemic dysentery with which Teveli is concerned are predominantly D and Shiga types, the agglutination by normal serum cannot be regarded as specific. Critical study of the literature supports the idea that the normal agglutinins are not residual agglutinins. The development of the normal agglutinins for dysentery bacilli is not explained; the antigens to these agglutinins are not certainly known and are not to be found among the causes of actual disease.

CRANE, Chicago.

THE RHEUMATIC DISEASES OF CHILDHOOD. A. F. HECHT, Wien. klin. Wchnschr. **48**:1521 (Dec. 6) 1935.

According to Hecht, a number of essentially different illnesses may be considered together under the heading "rheumatic diseases." Those occurring most frequently in childhood are infectious arthritis, acute rheumatic polyarthritis and rheumatoid illnesses which may occur after any infectious disease, or septic infections which may originate in the tonsils, teeth or accessory nasal cavities. Gonorrhea, syphilis, dysentery, scarlet fever, influenza or tuberculosis may also cause infectious arthritis. Primary chronic articular rheumatism (Still's disease) is said to be rare in childhood. Among other diseases may be mentioned arthritis deformans, aseptic necrosis of the bone and hemophilia. Acute articular rheumatism is characterized by fever and pain and swelling in the joints. Salicylates are used with good effect. The most frequent complication is endocarditis, less frequently myocarditis, pericarditis, chorea and iritis. Acute articular rheumatism is rare before the fourth year of life. The Aschoff nodules are characteristic of the disease and usually develop in the third week, though their presence may still be proved in the sixth month. Although acute articular rheumatism is an infectious disease, contagion is rare because there must be a special constitutional disposition. The theory of Reitter and Löwenstein that acute polyarthritis results from bacillemia due to the tubercle bacillus is acceptable to the author.

The knee and ankle are most frequently involved, more rarely the joints of the hand and shoulder. Sometimes the child is rendered completely helpless. The exudate in the joints is transparent and contains many degenerated leukocytes. The Wassermann reaction may be positive even though there has been no previous evidence of syphilis. On the other hand, even though there is syphilis of long standing, the reaction may be negative. There may be profuse sweating which cannot be explained merely by the presence of fever. Endocarditis occurs in one third of the cases of acute articular rheumatism in adults. In children this complication occurs in from 60 to 80 per cent of the cases. There may be recovery without valvular defect, but more frequently mitral insufficiency and mitral stenosis persist. Electrocardiographic examination will reveal the condition of the cardiac muscle. The clinical diagnosis of recent endocarditis is often difficult because the systolic murmurs may be accidental. The changes in the general condition of the patient will support the diagnosis. Pericarditis also is a more frequent complication in children than in adults.

Not infrequently articular rheumatism occurs as a result of syphilis. There is complaint of severe pain at night. Roentgen examination and the Wassermann test may be of slight aid in the diagnosis. Syphilis is indicated by osteomyelitis or gummatous periostitis of the long bones. Sometimes young infants suffer from suppurative mono-articular arthritis after influenza. Influenza bacilli are found on puncture of the joint. In about 2 per cent of the cases scarlet fever results in inflammations of the joints.

Primary chronic polyarthritis is an insidious illness, which first attacks the joints of the fingers, then leads to swelling and exudation and to regional swellings of the lymph glands. Rarely there is slight fever. Cardiac complications almost never occur. The patients become chronically ill. Tonsillectomy, which is often

effective in articular rheumatism, is of no avail. A disease peculiar to childhood was described by Still in 1897. There is chronic inflammation of the joints, with general swelling of the lymph glands and of the spleen. The endocardium is usually not affected, but pericarditis and pleurisy may develop. The fever curve is hectic. Sun baths, salt baths, exposure to radium rays and local treatment with ointment are effective.

ABT, Chicago.

SYSTEMIC SALMONELLA INFECTIONS IN MAN. C. J. WU and S. H. ZIA, Chinese M. J. **49**:1217 (Nov.) 1935.

Wu and Zia from the Peiping Union Medical College report fourteen years of case records of infection with Bacillus paratyphosus C, Bacillus suipestifer and Bacillus paratyphosus A and B.

Paratyphoid A is primarily a disease of late childhood and early adult life. Eighty per cent of the infections occurred in the second or the third decade, none in the first year of life. Males preponderated 5:1. There were 5 children under 10 years of age among 65 patients. Among 22 persons with paratyphoid B there were 12 under 10 years of age. Diarrhea was less common than constipation. Rose spots were present in 15 per cent of the cases, though 30 per cent of the children had some sort of rash. The average duration was two hundred and eight days. There was enlargement of the spleen in 42 per cent. A few had relapse, hemorrhage or perforation; of those with paratyphoid A about half had a white blood cell count below 6,000; there was a positive agglutination reaction in about 54 per cent. No hemorrhage or perforation was noted in paratyphoid B.

NEFF, Kansas City, Mo.

THE SERUM TREATMENT OF TYPHOID FEVER. H. YU, Chinese M. J. **50**:159 (Feb.) 1936.

This communication comes from the division of pathology of the Henry Lester Institute of Medical Research, Shanghai.

Various workers early experimented with the serums of animals which had been given injections of typhoid bacilli but found that an antitoxic serum could not be produced in this way. Likewise, typhoid antigens did not prove effective in passive immunization. Since 1934, interest has been renewed in the possibilities of a curative antityphoid serum (Felix' serum).

Yu reports the treatment of nineteen patients suffering from typhoid with two or three doses of from 20 to 50 cc. each, of Felix' serum. Eight of the patients showed definite reductions of the temperature and toxemia; two showed dramatic improvement. Yu thinks that the clinical experience is encouraging and warrants further trials, especially since typhoid is practically endemic in parts of China.

NEFF, Kansas City, Mo.

A SHORT HISTORY OF THE ACUTE INFECTIOUS DISEASES IN CHINA. LEE T'AO, Chinese M. J. **50**:172 (Feb.) 1936.

Infectious diseases are mentioned in the history of China as far back as 1105 B. C., and the danger from rabid dogs, in 556 B. C. Other diseases to which references are made include tuberculosis, dysentery, malaria, erysipelas, typhoid fever, smallpox and chickenpox. The infectious diseases which were late in being recognized in China are measles, diphtheria, plague, scarlet fever, cholera and meningitis.

During the reign of Chen Tsung, 998-1022 A.D., the prime minister attempted to find a way to save a son from getting smallpox, his former children having died of that disease. He took his child to a saint, who patted the child's head and told the parents that he was a proper subject for inoculation. On the seventh day after inoculation was done, fever appeared, and twelve days later the pustules became dry. Since then the procedure has been popular with the laity.

NEFF, Kansas City, Mo.

A Note on Immunization Against Typhoid Fever with Bacterium Pullorum. E. T. H. Tsen and Chen Kuei-Fang, Chinese M. J., supp. 1, February 1936, p. 195.

The authors were interested in the investigation of this new method for inducing prophylaxis against typhoid, as they thought it might be of great value. They therefore tried intraperitoneal injections of a vaccine made from cultures of Salmonella gallinarum in one series of mice and similar injections of a typhoid vaccine in another series of mice. A number of mice were kept untreated, as controls. Ten days after the second injection of these vaccines, half of each group of experimental and of control mice were given intraperitoneal injections of one lethal dose of a living twenty-four hour broth culture of Bacillus typhosus; the other half, one lethal dose of a living twenty-four hour broth culture of S. gallinarum. The mice were then closely watched for ten days. The typhoid vaccine produced immunity against B. typhosus and S. gallinarum. The salmonella vaccine gave immunity against the specific salmonella but not against typhoid bacilli.

Neff, Kansas City, Mo.

Weil's Disease in a Child. H. I. de Ruiter, Maandschr. v. kindergeneesk. **5**:163 (Jan.) 1936.

Weil's infection in a child of 2 years probably resulted from a fall into a ditch. The period of incubation was about eight days. The most prominent symptoms were psychic disturbances. Jaundice was lacking. After a feverless period of five days a slight relapse occurred, lasting two days.

van Creveld, Amsterdam, Netherlands.

## Chronic Infectious Diseases

First-Infection-Type Tuberculosis: Its Treatment and Prognosis. J. Arthur Myers, F. E. Harrington, C. A. Stewart and Marjorie Wulff, Am. Rev. Tuberc. **32**:631 (Dec.) 1935.

The early roentgen appearance of the parenchymal lesions of the first infection type of tuberculosis may be indistinguishable from that of the reinfection type or of pneumonia. A period of observation is necessary in most cases. When, however, in the absence of significant symptoms, a parenchymal shadow persists for one month or longer in a child who is sensitive to tuberculin, it is usually due to the tubercle bacillus. If after a longer period of observation the shadow gradually disappears to be replaced by calcium shadows in the parenchyma or in the region of the hilus, it may safely be regarded as representing the first infection type of tuberculosis. The shadows characteristic of the pneumonic stage usually persist for several months to a year or more. They may then disappear to be succeeded after months or years by the appearance of calcium shadows or fibrous strands. Throughout the course of the disease significant symptoms are usually absent, and this in the author's opinion is almost a diagnostic point. This benign course is so characteristic of first infection tuberculosis that even though it appears in young children and reaches considerable proportions, it is not of itself a serious condition unless secondary complications arise as the result of endogenous superinfections or reinfections. This holds true also of this type of disease as it occurs in young adults. The immediate prognosis of the first infection type of tuberculosis is excellent, and the authors, after long observation of many children, can see no indication for treatment, except in the rare case in which the condition is febrile.

While the immediate prognosis in this type of tuberculosis is good, as much cannot be said as to the future of these children. Present evidence indicates that about 20 per cent of children who react positively to tuberculin will ultimately show clinical pulmonary tuberculosis of the reinfection type. These chronic lesions

are usually detectable by roentgen rays, often two or more years before symptoms develop, and at this stage the disease may be most successfully treated.

The following is suggested as a rational plan for control of tuberculosis: Detect through tuberculin testing the infection of as many children as possible; reexamine and follow all positive reactors, and beginning at about the age of 10 or 12 years, make periodic roentgenograms of the chest; search out the source of the infection and treat or isolate as many as possible of the children with clinical symptoms; diagnose and treat as early as possible all children with the reinfection type of the disease.

EUGENE SMITH, Ogden, Utah.

MANTOUX TEST IN CHILDREN, WITH SPECIAL REFERENCE TO HOME CONTACTS. G. GREGORY KAYNE, Brit. J. Child. Dis. **33**:20 (Jan.-March) 1936.

For the initial injection a dilution of 1:10,000 is recommended, and the result is read on the third day. If the reaction is negative a 1:1,000 dilution is used, and if that reaction is negative or doubtful the test is concluded with a 1:100 dilution.

The author agrees with most workers in Scandinavia and America that there should be at least a 10 mm. wheal of erythema and swelling after forty-eight or seventy-two hours for the reaction to be called positive.

In a child less than 2 years old a positive reaction to the Mantoux test should be regarded as indicating the presence of an active tuberculous focus, unless the contrary is proved by further investigation.

The reaction to the Mantoux test cannot be considered negative unless a dilution of 1:100 has been used.

Hart has shown that a Mantoux test may give a negative reaction in about 3 per cent of clinically tuberculous persons. The antiallergic period must be kept in mind, and the fact that advanced generalized and meningeal tuberculosis, as well as certain infectious diseases (measles and scarlet fever), produce nonreactivity.

Every child less than 2 years of age who shows a positive reaction to the Mantoux test should have his chest studied roentgenographically. If no lesion is seen, he should be admitted to a hospital for further investigation. Even if the lesion is no longer active, the child has a better chance if given a few months under ideal conditions in an institution in the country. Children from 2 to 5 years of age should have roentgenograms of the chest made, and those over 5 as well, if practicable.

LANGMANN, New York.

MODERN OCCUPATIONAL THERAPY FOR THE TUBERCULOUS. PENDRILL VARRIER-JONES, Brit. J. Phys. Med. **10**:107 (Nov.) 1935.

Varrier-Jones emphasizes the importance of occupational therapy along commercial lines for the tuberculous patient. He feels that the patient not only is more interested in life but will be better able to compete with his neighbors when he returns to his normal life.

HARTMAN, Cleveland.

LIGHT AND PULMONARY TUBERCULOSIS. J. E. WOOD, Brit. J. Phys. Med. **10**:110 (Nov.) 1935.

Wood emphasizes the necessity of choosing persons with chronic or subacute pulmonary tuberculosis for treatment with light. Natural sunlight is preferred. Several short periods a day are given to avoid the possibility of overheating.

HARTMAN, Cleveland.

SURGICAL TUBERCULOSIS IN CHILDREN. S. N. MALHOTRA, M. Digest **3**:420 (Feb.) 1936.

Surgical tuberculosis, although not as frequent in India as in England, is nevertheless met with fairly often. Bad hygiene, insufficient food and neglect of

children are important predisposing causes, and infected milk and contact with persons with tuberculosis are guarded against insufficiently. More active supervision must be had if the spread of tuberculosis is to be prevented. The treatment of surgical tuberculosis, particularly tuberculosis of the spine, does not give encouraging results. Malhotra thinks that open operation establishing a bony ankylosis brings about better results than simple immobilization.

LESLIE, Evanston, Ill.

INFLUENCE OF AGE AND SEX ON THE CUTANEOUS TUBERCULIN TEST. P. NOBÉCOURT, Gaz. d. hôp. **109**:641 (May 6) 1936.

Over two thousand children from 6 to 15 years old were tested. Among those aged 7 years, 36.8 per cent of the boys and 42.2 per cent of the girls gave a positive reaction to the Pirquet test; while among those aged 15 years, 72.4 and 73.4 per cent, respectively, gave positive reactions.

The increase in the number of positive reactions was not uniform; two peaks, at 11 and at 14 years, were observed.

At the age of 7 years only 8.5 per cent of the boys and 11.8 per cent of the girls had active tuberculous processes, while the number with active processes increased to 16 and 25 per cent, respectively, at 15 years.

The influence of growth is not borne out by these statistics. Puberty has some influence, but the real explanation of the increase lies in external factors —either the children begin to work in industries or the school work becomes harder at this age, and they obtain less fresh air, fatigue is greater and the chance of exposure is increased.

KAJDI, Baltimore.

FRIEDREICH'S DISEASE DUE TO CONGENITAL SYPHILIS. L. BABONNEIX, Gaz. d. hôp. **109**:650 (May 6) 1936.

The case of a 15 year old girl with Friedreich's disease is reported. Although the reaction to the Wassermann test was negative, the patient was regarded as syphilitic because the maternal grandmother suffered from dementia paralytica and the mother from tabes. Thirteen cases of Friedreich's disease of syphilitic origin have been reported in the literature.

KAJDI, Baltimore.

EXPERIMENTAL STUDIES ON TUBERCULOUS MENINGITIS. A. BOQUET and R. BROCA, Paris méd. **1**:17 (Jan. 4) 1936.

This article sheds considerable light on the pathogenesis of tuberculous meningitis. Suboccipital injections of bovine, avian and human tubercle bacilli into the rabbit and the guinea-pig produced typical tuberculous meningitis in all instances whether the animal had previously been rendered allergic or not. Meningitis which might be fatal or from which recovery might take place developed after the injection of tubercle bacillus proteins. In no instance was meningitis produced by the intravenous injection of organisms, although virulent tubercle bacilli causing the bovine and the avian type of tuberculosis could be recovered from the brain of animals so inoculated.

LESLIE, Evanston, Ill.

TUBERCULOSIS IN THE SCHOOL CHILD. J. MORENO CENICEROS, Arch. españ. de pediat. **20**:22 (Jan.) 1936.

Moreno Ceniceros discusses in detail the measures which have proved to be most valuable and effective in the arrest and control of tuberculous infection in the school child. He points out the great possibilities for control by the school physician, the value of tuberculosis dispensaries and preventoria and the need for adequate functioning of a number of auxiliary agencies which come within the sphere of the child's school life.

He expresses the belief that the most effective fight against tuberculosis can be waged during the school age.

SCHLUTZ, Chicago.

THE VALUE OF THE MEINICKE REACTION IN CONGENITAL SYPHILIS. ANTONIO SELLEK AZZI and ALEJANDRO DEL FRADE, Arch. de med. inf. **4**:229 (Dec.) 1935.

The authors use small quantities of serum for the Meinicke test which is designated the Meinicke clarification reaction (M. K. R. II). Instead of 0.2 cc. and 0.1 cc. of serum, 0.01, 0.03 and 0.05 cc. are used. In 785 cases the Meinicke and Kahn reactions were negative in 48 instances, but the reaction to M. K. R. II was positive. This, therefore, gives another method for the diagnosis of congenital syphilis, which apparently is more sensitive than those now in use.

SANFORD, Chicago.

OCCULT TUBERCULOSIS AND PULMONARY TUBERCULOSIS IN THE SCHOOL CHILD. RAUL ORTEGA, Rev. chilena de pediat. **6**:519 (Nov.) 1935.

The frequency of pulmonary tuberculosis and occult tuberculosis was investigated in 918 children between the ages of 4 and 15 years. Ortega found that the tuberculin test of von Pirquet gives as high a percentage of positive reactions as is obtained by other investigators with the intracutaneous test. The reaction was positive in 61.25 per cent of the cases. Occult tuberculosis was found in about 50 per cent of the cases. Benign tuberculosis requiring medical attention was found in 3.79 per cent.

The figures indicate the gravity of the problem in Chile and particularly in Santiago.

SCHLUTZ, Chicago.

THE EFFECT OF HUNGER ON THE COURSE OF TUBERCULOSIS IN GUINEA-PIGS. W. SCHMIDT-LANGE, Arch. f. Hyg. **115**:9 (Oct.) 1935.

Schmidt-Lange points out that it is difficult to evaluate the effect of hunger alone on the course of tuberculosis in human subjects because of the additional psychic and hygienic factors which come into play. In guinea-pigs under standard conditions a worse form of tuberculosis was produced in hungry animals than in a well nourished control series. The differences, however, appear only when a large series of animals are used.

GLASER, Rochester, N. Y.

CONGENITAL TUBERCULOSIS. S. SCHEIDEGGER, Monatschr. f. Kinderh. **65**:1, 1936.

A 12 day old child showed dulness over both lungs and high fever and died with marked cyanosis. The autopsy showed disseminated tuberculosis, with tubercles located centrally in the liver, lungs and spleen. Many of these had progressed to caseation. Miliary tubercles were found to be especially thick in the cardiac and skeletal muscles.

The mother died of tuberculosis two and one half months after the birth of the child. The caseous nodules in the liver, spleen and lungs of the infant were unquestionably the result of infection from the mother's blood stream. The rarity of congenital tuberculosis led Scheidegger to report the case.

GERSTLEY, Chicago.

CLINICAL AND EXPERIMENTAL STUDIES ON THE INFECTIOSITY OF TUBERCULOUS CHILDREN. B. SÖDERLING, Nord. med. tidskr. **10**:2001 (Dec. 7) 1935.

Forty tuberculous children from fifteen of whom bacilli were obtained (lavage of the stomach) and of whom thirteen had severe cough were permitted to use twenty-four healthy guinea-pigs as playmates during from 8 to 61 days. The animals were not infected by the children, as shown by a negative reaction to tuberculin and negative necropsy findings six months after exposure. Three of the children who had extensive pulmonary changes were ordered to cough against petri dishes, which were cleaned after each cough with water, and this water was injected into guinea-pigs. From only one of these children, an infant with miliary tuberculosis, did the guinea-pig contract tuberculosis.

WALLGREN, Göteborg, Sweden.

TUBERCULOSIS AMONG STUDENTS. M. R. HEYNSIUS VAN DEN BERG, Nederl. tijdschr. v. geneesk. **80**:945 (March 7) 1936.

This paper was given as a clinical lecture on the occurrence of tuberculosis among different groups of persons, more especially among students of different countries. The author pleads for a medical (also roentgenographic) examination of the students in the Netherlands such as is given in some other countries and mentions the measures to be taken, especially by the medical students, for the prevention of tuberculosis. He is of the opinion that medical control is more essential now that the percentage of medical students in the Netherlands who show a negative reaction to the tuberculin test has increased to a high degree within the last few years.

VAN CREVELD, Amsterdam, Netherlands.

INFESTATION WITH PENTASTOMA DENTICULATUM AMONG INHABITANTS OF AMSTERDAM. M. STRAUB, Nederl. tijdschr. v. geneesk. **80**:1468 (April 4) 1936.

In fifty-six of two hundred and eleven persons (27 per cent) in Amsterdam aged 10 years or more foci due to Pentastoma denticulatum were noted in the lungs post mortem. In twenty-four of fifty-four persons (44 per cent) over 60 years of age these foci were seen. Occasionally seven or eight foci were present in the lungs of one person, but the average number was two.

VAN CREVELD, Amsterdam, Netherlands.

## Diseases of Blood, Heart and Blood Vessels and Spleen

THROMBOPENIC PURPURA: AN ANALYSIS OF ONE HUNDRED AND SIXTY CASES. W. M. FOWLER, Ann. Int. Med. **9**:1475 (May) 1936.

Idiopathic and secondary thrombopenic purpura are considered with respect to the etiology, prognosis and treatment. Of a total of 160 cases studied 143 were of the secondary type.

Emphasis is placed on the necessity for accurate diagnosis, a proper period of observation and the effect of blood transfusions in the cases of idiopathic thrombopenic purpura before splenectomy is resorted to. If splenectomy is decided on it should be performed during a quiescent period, since the operation carries a high mortality when performed during the acute stage. Other methods of treatment are briefly considered.

READING, Galveston, Texas.

FENESTRATION OF THE NUCLEI OF LYMPHOCYTES: A NEW DIAGNOSTIC SIGN IN INFECTIOUS MONONUCLEOSIS. E. E. OSGOOD, Proc. Soc. Exper. Biol. & Med. **33**: 218 (Nov.) 1935.

Fenestration of the nuclei of lymphocytes was observed in twelve cases of infectious mononucleosis. The fenestrated nuclei appeared to have multiple holes piercing them in various directions. They were too numerous to be nucleoli, and the background was the same color as the rest of the nucleus, only paler. These fenestrations may occur in normal or large lymphocytes, but they most often appear in the smallest of the otherwise normal lymphocytes. They may be present in a relatively small proportion of the lymphocytes and may not be observed if only one hundred cells are examined.

HANSEN, Minneapolis.

TREATMENT OF HEMORRHAGIC DISEASES. H. L. TIDY, Brit. M. J. **1**:850 (April 25) 1936.

A classification of hemorrhagic diseases is given. Various tests are outlined which aid in differential diagnosis. In the treatment, blood transfusion and splenectomy are given prominence. The results of splenectomy are outlined.

ROYSTER, University, Va.

NUTRITIONAL ANAEMIA IN INFANCY AND CHILDHOOD. W. T. W. PAXTON, Glasgow M. J. **7**:153 (April) 1936.

The hemoglobin gradually falls after birth until the third month; it then rises until the sixth month, depending on the diet. Children receiving iron for three months or more had, on the average, 10 per cent higher hemoglobin, were 1 pound (454 Gm.) heavier and had 50 per cent less morbidity than those not receiving iron. The artificially fed babies showed lower hemoglobin than the breast fed. No treatment halts the decline of hemoglobin up to the third month, but from then on administration of iron is of value. An anemic mother's baby may be born with normal hemoglobin but have a deficient reserve. In twins and premature infants anemia is likely to develop. More rapidly growing babies have lower hemoglobin. Chronic infection makes the anemia more pronounced. Copper aids in curing anemia in rats but probably not in babies. Vitamin C and thyroxine are sometimes concerned in hypochromic anemia.

The clinical picture is described.

The treatment consists in the use of ferrous sulfate. Paxton states that not all the salt goes to form hemoglobin; some is stored, and some is lost in the stools. Ferric salts may be used, but the ferrous salt acts more rapidly. Mixtures of ferrous salts must be made up weekly, as the ferrous salt in solution changes to the ferric. Liver is of no particular value.

SNELLING, Toronto, Canada.

PRIMARY ERYTHROBLASTIC MALIGNANT ANEMIA IN AN INFANT TWIN. N. SPYROPOULOS, Bull. Soc. de pédiat. de Paris **34**:245 (April) 1936.

A boy 9 months old, a twin, presented the picture of severe anemia, the onset of which occurred about four months before. The other twin was healthy, and the family history was not relevant. It is not mentioned whether the twins were uniovular or binovular, and no roentgenologic examination of the skeleton was made. Although the report leaves a good deal to be desired in any attempt to classify the anemia, Spyropoulos offers criticism of the prevailing nomenclature and prefers the title given.

BENJAMIN, Montreal, Canada.

PARIETAL STAPHYLOCOCCIC ENDOCARDITIS OF THE RIGHT SIDE OF THE HEART. M. SENDRAIL, J. GADRAT and J. LASSERRE, Bull. Soc. de pédiat. de Paris **34**:255 (April) 1936.

A boy 12 years old had septicemia, and Staphylococcus albus grew from repeated cultures of the blood. He died on the tenth day of illness. No cardiac murmurs were heard. Necropsy revealed vegetative endocarditis on the wall of the right side of the heart without any involvement of the valves. There were also degenerative myocardial changes and microscopic emboli in the lungs. An organism the same as that found in blood cultures was grown from the surface of the vegetations.

BENJAMIN, Montreal, Canada.

FLUCTUATIONS OF THE DIFFERENTIAL COUNT CORRESPONDING TO LOCAL CHANGES IN TEMPERATURE. A. DE LA GRANDA and F. VEGAS, Pediatría españ. **25**:125 (April) 1936.

De la Granda and Vegas used thirty-one children and made ninety-one readings in the following manner:

The hand of the subject was introduced into water at 10 C. for five minutes, and then a smear of blood from the finger-tip was obtained immediately. The same hand was then kept at 50 C. for a similar period and a smear of blood

obtained immediately. The subjects were classified into three groups according to change in the differential count with the change from cold to heat:

Group 1
- (*a*) Polymorphonuclears decreased
- (*b*) Lymphocytes increased
- (*c*) Monocytes slightly increased

Group 2
- (*a*) Monocytes increased
- (*b*) Lymphocytes decreased
- (*c*) Polymorphonuclears very slightly decreased

Group 3
- (*a*) Lymphocytes stationary
- (*b*) Polymorphonuclears decreased
- (*c*) Monocytes increased

The responses in group 1 were obtained in normal children; those in groups 2 and 3, in children showing one or more pathologic conditions.

The changes observed were constant for the same person and for persons of similar constitutional types.

SCHLUTZ, Chicago.

ROENTGENOGRAPHIC DIAGNOSIS OF DISEASE OF THE MITRAL VALVE. S. DEDIĆ, Fortschr. a. d. Geb. d. Röntgenstrahlen **53**:665 (April) 1936.

A roentgen diagnosis of disease of the mitral valve, to be dependable, demands examination of lateral films of the heart. The profile of the heart in which there is involvement of the mitral valve is characteristic: The left atrium is enlarged and usually bulges in such a manner that the distance between it and the vertebral column is decreased by as much as 0.5 cm. This finding is more characteristic than anything which can be demonstrated in frontal films.

McCUNE, New York.

ERRORS IN BLOOD TRANSFUSION. FRITZ VON SCHÜRER, Wien. klin. Wchnschr. **48**:1599 (Dec. 27) 1935.

Most of the complications which result from blood transfusion, says Fritz von Schürer, result from unsatisfactory preliminary tests of the blood. He recommends that central stations for the testing of blood be set up at convenient points, because small hospitals are not adequately equipped to make the necessary thorough examinations. Repetition of a transfusion from the same donor if the blood is suitable is not harmful according to von Schürer, although some authors have reported anaphylactic sensitization of the patient. Hemolysis is a frequent danger in transfusion. It has often been observed that symptoms of hemolysis at the beginning of the procedure are incorrectly evaluated and their significance is underestimated. If blood of unsuitable type is being used, changes are caused in the circulatory system, producing histamine substances in the erythrocytes which are freed by hemolysis. Special care should be taken to see that a donor is free from any infectious disease. Obvious as this may seem, it is often overlooked. Regarding the patient, transfusion is contraindicated if there is any cardiac decompensation due, for example, to myocarditis or dilatation. Transfusion is not advised in myeloid leukemia or in lymphatic leukemia unless there is a high degree of anemia or if there is venous thrombosis or thrombophlebitis. After transfusion the donor should lie down for a time. There may be severe faintness if he gets up too soon. The donor should be protected from infection if the patient suffers from an infectious disease. He should not give more than 500 cc. of blood at one time, and at least six weeks should elapse before he gives blood for another transfusion.

ABT, Chicago.

INFECTED VALVULAR DAMAGE AND ITS CONSEQUENCES IN CHILDHOOD. P. KISS, Orvosi hetil. **79**:1259 (Nov. 30) 1935.

Endocarditis may be divided clinically into two groups: endocarditis simplex and endocarditis maligna. Endocarditis simplex is caused by rheumatic infection. Not only severe rheumatic infections with high fever may cause endocarditis but also the mild infections. For the treatment of endocarditis simplex the best method is that of Stolte: sodium salicylate should be given for three days, the number of grams in the daily dose being equal to one third of the child's age in years. The recurrence of an infection is much more severe. In these cases usually the myocardium and the pericardium also are damaged (20 per cent). Endocarditis maligna may be divided into two groups: endocarditis maligna acuta and endocarditis chronica lenta. The functional murmurs are always caused by myocarditis, which causes the bad closing of the valvula mitralis. These murmurs are "atonic."

GÖTTCHE, Budapest, Hungary.

SPLENIC ENLARGEMENT IN INFANTS AND CHILDREN. F. T. CHU and S. DEITRICK, Chinese M. J. **50**:382 (April) 1936.

Chu and Deitrick have made a statistical study of 1,028 cases of enlargement of the spleen. The condition is common among the Chinese. The cases reported were met with in the pediatric outpatient clinic at the Peiping Union Medical College Hospital.

The enlargement is seen most frequently in the first years of life. It has been found in association with thirty-two different diseases but most commonly in association with kala-azar, bronchitis, pulmonary tuberculosis, pneumonia, infantile diarrhea, eczema, congenital syphilis, infection of the skin and subcutaneous tissue, whooping cough and infections of the mouth and throat. The writers believe that infections of the upper or lower respiratory tract are so frequently accompanied by splenic enlargement that clinicians should not be unnecessarily concerned when there is splenic enlargement alone.

NEFF, Kansas City, Mo.

## Diseases of Nose, Throat and Ear

FOREIGN BODIES IN THE AIR AND FOOD PASSAGES. J. A. COYLE and L. K. SYCAMORE, New England J. Med. **214**:677 (April 2) 1936.

This article contains a historical résumé of the development of instruments for inspection of the larynx, trachea, bronchi and esophagus and a report of cases in which foregn bodies were removed; three of the patients were children.

GENGENBACH, Denver.

TONSILLECTOMY BY DIATHERMY (ELECTROCOAGULATION). M. P. BOEBINGER, New Orleans M. & S. J. **88**:750 (June) 1936.

Boebinger enthusiastically recommends electrocoagulation as a commendable adjunct to orthodox surgical treatment of the tonsils. It is especially advised in cases in which surgical removal is contraindicated for any reason.

He does not consider it the method of choice in children, though he has used it 7 times in children aged 6 to 12 years. In 3 of these cases the adenoids were also removed.

Crystals of cocaine hydrochloride were preferred for anesthesia, but a 2 per cent solution of nupercaine was occasionally used.

Multiple sittings and a meticulous technic are stressed. He considered his results satisfactory in 90 per cent of his 200 cases.

No case has been made for the use of this method in children.

BERKLEY, Los Angeles.

THE PROGNOSIS OF MODERATE DEAFNESS IN YOUTH: VARIATIONS WITH DISEASE, MANAGEMENT AND TREATMENT. E. P. FOWLER, New York State J. Med. **36**:607 (April 15) 1936.

A study of thousands of audiograms over a period of years shows that while clinical treatment and management are often not satisfactory, much can be done to prevent deafness in children.

AIKMAN, Rochester, N. Y.

AN ANALYSIS OF OVER FOUR THOUSAND CASES OF EDUCATIONAL DEAFNESS STUDIED DURING THE PAST TWENTY-FIVE YEARS. MACLEOD YEARSLEY, Brit. J. Child. Dis. **32**:107 (April-June); 196 (July-Sept.); 264 (Oct.-Dec.) 1935.

Hereditary deafness at birth is biologic, while sporadic deafness at birth is a manifestation of disease. A paramount characteristic of hereditary deafness at birth is that it follows the mendelian ratio. In the inheritance of deafness hearing appears to be a dominant character and deafness a recessive; hence, in order that the number of persons with hereditary deafness at birth may be reduced, it is important that those known to carry the recessive character should be allowed to mate only with persons who can hear and whose family histories are without taint of deafness. In the present state of society an endeavor to eradicate deafness by preventing the breeding of all persons with undesirable dominant characteristics and of all those with undesirable recessive characteristics would be regarded as grossly unjust.

In sporadic deafness at birth the problem is one of disease rather than of inheritance. The factors that are involved are those of environment and disease. Better housing, hygiene and ventilation and the reduction of unemployment are a few of the factors.

The subject of acquired deafness and the various diseases that are mainly responsible are discussed in detail.

Finally, the matter of detecting deafness in infants and in persons of preschool and of school age is considered. The series of articles concludes with a discussion of education of the deaf.

LANGMANN, New York.

ACUTE OTITIS MEDIA. A. CAMPBELL, Brit. M. J. **1**:788 (April 18) 1936.

Campbell outlines his experience and gives the results of his method of treatment, with especial reference to early paracentesis. Only 7 per cent of the patients who had early paracentesis required operation on the mastoid.

ROYSTER, University, Va.

CHRONIC SUPPURATIVE OTITIS MEDIA. M. R. SHERIDAN, Brit. M. J. **1**: 791 (April 18) 1936.

Sheridan outlines his observations, based on careful investigation. In most of the patients chronic otitis media was the result of involvement of the mastoid. He thinks the radical operation should be performed rather than any representing a compromise, unless the tympanic membrane can be left practically intact or in a position to heal.

ROYSTER, University, Va.

MULTIPLE PAPILLOMA OF THE LARYNX. A. CODINACH Y SEGUGA, Arch. de med. inf. **5**:152 (April-June) 1936.

A case is reported of multiple papilloma of the larynx in a child of 9 years. The condition is rather rare and gives rise to alarming symptoms. It frequently recurs. The best treatment is direct removal and the application of some modifying liquid to the base.

SANFORD, Chicago.

RÔLE OF MASTOIDITIS IN INFANT PEDIATRICS. E. VON GYÖRGY, Arch. f. Kinderh. **108**:13 (April 28) 1936.

A series of cases in which grip, enteritis and dysentery were complicated by mastoiditis demonstrates that mastoiditis as a complication can produce a severe toxic form of the primary disease. Often improvement in the toxicosis can be expected after drainage of the mastoid. The indication for operation depends on exclusion of other factors by thorough clinical examination, since local evidence of mastoid infection may be slight. There must be no delay, since only by operating at the proper time can good results be obtained.

CRANE, Chicago.

## Diseases of Lungs, Pleura and Mediastinum

NONTUBERCULOUS PULMONARY DISEASE SIMULATING TUBERCULOSIS IN CHILDREN. CHRISTIAN W. NISSLER, MARTIN J. SOKOLOFF and LOUIS COHEN, Am. Rev. Tuberc. **32**:702 (Dec.) 1935.

Three cases are reported illustrating the problems arising in the differentiation of nontuberculous from tuberculous disease in children. In all three the condition had been diagnosed as pulmonary tuberculosis by positive tuberculin reactions and roentgen studies. The final diagnoses were atelectatic pneumonic consolidation due to bronchial obstruction with granulation tissue, congenital cysts of the lungs and pulmonary fibrosis. The correct diagnoses were arrived at after repeated roentgen examination and laboratory investigation, especially of the sputum and the gastric contents. Bronchoscopic studies were also of great value in providing direct visualization of the bronchi and in obtaining secretions free from contamination.

EUGENE SMITH, Ogden, Utah.

BRONCHOSCOPIC STUDIES OF ABSCESS OF THE LUNG. I. B. GOLDMAN, Arch. Otolaryng. **23**:414 (April) 1936.

Goldman deals with bronchoscopic findings and their interpretation in subacute and in chronic abscess of the lung. Bronchoscopic examination can reveal the position and extent of the pathologic processes in the lung and define the area to be surgically exposed. After the site of the bronchopulmonary segment lodging the abscess has been determined and the bronchoscope passed, the odor or presence of pus plays an important part in the diagnosis. The bronchoscope facilitates the removal of the infection.

GREENWOOD, Chicago.

COMPARATIVE ACTIONS OF SYMPATHOMIMETIC COMPOUNDS: BRONCHODILATOR ACTIONS IN BRONCHIAL SPASM INDUCED BY HISTAMINE. W. M. CAMERON and M. L. TAINTER, J. Pharmacol. & Exper. Therap. **57**:152 (June) 1936.

Cameron and Tainter studied the action of numerous sympathomimetic amines and atropine on the bronchi of dogs constricted by histamine. Epinephrine seemed to be the most active; ephedrine had little action. The action of atropine was prompt but moderate.

PILCHER, Cleveland.

BLOOD SEDIMENTATION CURVES IN PNEUMONIAS. CLYDE BROOKS, Proc. Soc. Exper. Biol. & Med. **34**:380 (April) 1936.

Using a new method which he has devised, the author found that early in pneumonia there is a greatly accelerated sedimentation rate, which gradually returns to normal as the patient recovers. The normal curve does not occur until all signs obtained by roentgenographic and physical examination are normal, indicating that the sedimentation rate is highly sensitive to a pathologic condition in the lungs. In cases of severe pneumonia in which the clinical condition proceeds to grow worse, the sedimentation curve is more abrupt and falls to still lower levels; thus this type of curve constitutes a bad prognostic omen.

HANSEN, Minneapolis.

STUDIES IN PNEUMONIA WITH SPECIAL REFERENCE TO AGGLUTININS. G. J. LANGLEY, W. MACKAY and L. STENT, Quart. J. Med. **5**:251 (April) 1936.

The blood serums of patients suffering from lobar pneumonia were examined for agglutinins. The effect of serum therapy on the occurrence of agglutinins was also tested. It was found that agglutinins are recognizable in the serum of the patient with lobar pneumonia when the infection is due to organisms of type I or type II. These agglutinins are closely related to recovery, being absent in cases in which the infection is fatal.

After intravenous administration of 20,000 units each of concentrated type I and type II pneumococcus serum, agglutinins for the heterologous organisms are readily recognizable in the patient's serum but may disappear in connection with injection of homologous serum.

It is suggested that the test for agglutinins offers a reasonable means of determining the number of doses of serum required in any patient.

BRADFORD, Rochester, N. Y.

TREATMENT OF SOME COMMON RESPIRATORY DISEASES IN CHILDREN. U. S. RAO, M. Digest **3**:444 (Feb.) 1936.

Rao devotes the first part of this article to respiratory disturbances in the newborn. The treatment of asphyxia and aspiration pneumonia is discussed in detail. The recognition of the importance of the treatment of coryza among older children is emphasized, as the condition may mean a chronic infection or an allergic condition. Bronchitis, bronchopneumonia, asthma and whooping cough are also discussed. It is interesting to note that the author, whose practice is in Bombay, India, says that he sees lobar pneumonia almost always as a complication of bronchitis and that he treats it the same as he does bronchitis and bronchopneumonia.

LESLIE, Evanston, Ill.

ACTINOMYCOSIS OF THE LUNG. DONALD PATERSON, Proc. Roy. Soc. Med. **29**:211 (Jan.) 1936.

A child aged 8 years became listless and began to lose weight in May 1935. At the beginning of June the mother noticed a small hard tender lump developing on the right side of the chest. There was also a short dry cough. Ten days later the child was seized with a sharp pain in the right side and became breathless. The condition on examination, laboratory findings, report of the radiologist, complications of progress and treatment are given in the report.

WILLIAMSON, New Orleans.

SPONTANEOUS PNEUMOTHORAX IN EARLY CHILDHOOD. A. TUNESI, Riv. di clin. pediat. **34**:392 (May) 1936.

Three cases of spontaneous pneumothorax are reported in children 1, 1 and 3 years of age, respectively. The children had bronchopneumonia. Empyema (pyopneumothorax) developed in each case, followed by death. An autopsy of one child was made.

The mechanism of the pneumothorax was believed to be due to rupture of cordlike pleural adhesions to the wall of the chest due to coughing.

HIGGINS, Boston.

ENDOGENOUS REINFECTION AFTER PERFORATION OF A BRONCHUS. KARL DIETL, Arch. f. Kinderh. **108**:65 (May 10) 1936.

A report of one case is given.

CRANE, Chicago.

ATELECTASIS AND "DIRECTED" COLLAPSE OF THE LUNGS. F. FLEISCHNER, Fortschr. a. d. Geb. d. Röntgenstrahlen **53**:607 (April) 1936.

Pulmonary atelectasis may result from compression of the lung by external forces or from interference with tidal ventilation and more or less prompt resorption of the gases which are contained in the alveoli. The density of the shadow cast by an atelectatic portion of the lung depends considerably on whether there has been simply a loss of air, with collapse of the alveoli, or an exudation of fluid into the alveoli. The latter phenomenon occurs rather frequently in atelectasis, particularly in the variety which results from occlusion of a bronchus.

In recent times attention has been directed to certain relatively thin, linear shadows which are seen in the roentgenograms of the chests of persons suffering from inflammatory disease of the abdomen. These shadows bear a close resemblance to those which are thought to be characteristic of interlobular pleurisy. On the basis of clinical observations and anatomic studies, Fleischner asserts that such shadows are due to atelectasis and limited absorption in a single place or stratum of the lung; the characters of this plane are determined by numerous factors, most important of which are the holding of the lung in apposition to the rigid thoracic wall by negative intrapleural pressure and the tendency of the lung to collapse in a direction which is determined by the intrinsic elasticity of the pulmonary tissue. This varies somewhat in individual cases. The shadows are usually horizontal. This phenomenon, which is known as "directed atelectasis," may occur under a variety of circumstances other than acute disease of the abdomen.

McCUNE, New York.

## Diseases of the Gastro-Intestinal Tract, Liver and Peritoneum

CONGENITAL UMBILICAL FISTULA. M. H. STREICHER, Illinois M. J. **69**:355 (April) 1936.

This article includes a report and a discussion of a congenital umbilical fistula which Streicher removed surgically from a patient 21 years old.

BARBOUR, Peoria, Ill.

ANOREXIA IN CHILDREN. M. B. LOW, New England J. Med. **214**:834 (April 23) 1936.

That the etiologic background of anorexia is often purely psychic becomes evident when it is found that the loss of appetite is cured by hospitalization or by placement in a summer camp or a boarding school. Attempts to make children's weights conform to the standards of charts are the principal cause of anorexia. Probably the most prominent cause in an otherwise well child is some one's determination to make a child eat a definite amount of food at each meal, day in and day out.

At least three facts enter into the explanation of this biologic phenomenon of the young person refusing to eat: First, it is a common trait of human nature to rebel against arbitrary authority. Second, it is again a part of human nature to glory in attention. Third, it is established and well known that the gastric contractions due to hunger and the physical discomfort attendant on them are abolished in the presence of emotions.

In treatment, first, one must make sure that a diet adequate as regards quantity and quality is provided; second, one must see to it that no child is forced to eat (except in rare circumstances, for instance, in typhoid fever); third, one must eliminate organic disease (focal infections, anemia, chronic pyelitis, tuberculosis, syphilis, nasal obstructions, carious teeth).

GENGENBACH, Denver.

INFECTIOUS GASTROENTERITIS. J. P. GAREN, New York State J. Med. **36**:495 (April 1) 1936.

For several years unexplained epidemics of gastro-enteritis have occurred in Olean, N. Y. This study of an epidemic of 1,000 cases in 1934 did not disclose the causative factor. Garen discusses similar reports from other parts of the country.

AIKMAN, Rochester, N. Y.

STUDIES IN COELIAC DISEASE. E. BADENOCH and N. MORRIS, Quart. J. Med. **5**: 227 (April) 1936.

Curves for the absorption of sugar by the blood in celiac disease were studied. The curves approach normal height in convalescence but are very flat during the acute stage of the disease.

Ingested banana gives higher curves than ingested dextrose.

Flat curves are not pathognomonic for celiac disease since they are obtained in hypothyroidism and in marasmus. Fat administered simultaneously with dextrose flattens the blood sugar curves in healthy children.

The conclusion is that fermentation of carbohydrate is an important factor in the production of the flat curve that is seen after administration of dextrose.

Children with celiac disease are more sensitive to the effect of insulin than are children with nonceliac conditions. Injection of anterior pituitary extract into a child with celiac disease during fasting raises the level of the blood sugar and causes slight improvement in the absorption of fat but does not promote growth.

BRADFORD, Rochester, N. Y.

CLINICAL CONDITIONS ASSOCIATED WITH CONGENITAL ANOMALIES OF THE SMALL INTESTINE. ALBERT H. MONTGOMERY, Wisconsin M. J. **34**:826 (Nov.) 1935.

Three groups of anomalies—those of rotation of the intestine, changes in the lumen and abnormalities of the vitelline duct, each with subheadings—are discussed.

The clinical picture of obstructive lesions in the new-born (stenosis, atresia, aplasia and congenital volvulus) is definite and usually readily diagnosed.

A flat roentgen plate in the upright position will aid in giving the level of the difficulty. Barium should never be given by mouth because of its interference with any operative procedure necessary. A few cases of mild congenital obstruction may be treated by dietary measures. Patients with atresia and aplasia usually die in five or six days unless surgically treated.

Care in making the anatomic corrections, stabilization, freeing of adhesions, etc., are needed to prevent recurrence of obstruction, especially in the case of volvulus.

The mortality rate for these conditions is extremely high and probably will always remain so.

In the third group, anomalies derived from remnants of the omphalomesenteric or vitelline duct, Meckel's diverticulum is from two to four times more frequent in males than in females. Clinical symptoms associated with it are likely to be due to peptogenic ulcer with or without perforation, diverticulitis, intestinal obstruction or formation of a tumor, peptogenic ulcer being the most frequent and interesting. The occasional presence of blood in the stool aids greatly in differentiating diverticulitis from appendicitis. Meckel's diverticulum is a frequent cause (5 to 7 per cent [Kuttner]) of all intestinal incarcerations through forming a strangulated loop, inflammation with adhesions, volvulus or infolding and intussusception by peristaltic action. Early surgical intervention is indicated in all these conditions.

If Meckel's diverticulum is incidentally found in the course of a laparotomy, it should be removed for prophylactic reasons.

JANNEY, Wauwatosa, Wis.

CHRONIC JAUNDICE IN THREE BROTHERS WITH HYPERTROPHIC CIRRHOSIS OF THE LIVER AND INFANTILISM. AMIR CHAND, Brit. J. Child. Dis. **33**: 31 (Jan.-March) 1936.

The clinical features manifested by three brothers tallied in almost all respects with those of Hanot's cirrhosis and could not be accounted for by Banti's disease, acholuric jaundice, chronic infective cholangeitis or ordinary cirrhosis. These patients were seen in Amritsar, India.

LANGMANN, New York.

MUCOID CARCINOMA OF THE CAECUM IN A BOY OF THIRTEEN YEARS. ROBERTSON F. OGILVIE, Brit. J. Surg. **23**:610 (Jan.) 1936.

Carcinoma of the cecum in childhood is a rarity, only fifteen cases having been reported, including that of Ogilvie. The average age at which it is usually diagnosed is 49 to 52. The condition is usually confused with hypertrophic tuberculosis of the cecum. The outstanding symptoms in Ogilvie's case were pain and vomiting. On physical examination swelling in the right iliac fossa was noted.

Metastases occur by the lymphatic route—transfer to the regional mesenteric glands and thence by the para-aortic route to the glands of the lesser omentum and the bronchial glands, whence by perivascular spread the tumor reaches the lungs. Metastases in the skull might occur through erosion of the pulmonary vein and spreading of the tumor by the hematogenous route. No secondary growths in the liver have been observed. The outstanding pathologic feature is mucoid degeneration.

SUMMERFELDT, Toronto, Canada.

MALFORMATIONS OF THE RECTUM AND ANUS. B. G. MALLYA, M. Digest **3**:421 (Feb.) 1936.

Mallya gives a short discussion of the treatment of imperforate anus. In most cases a longitudinal incision over the bulging rectum and the introduction of a petrolatum gauze plug is sufficient. When attempts at finding the bowel fail, inguinal colostomy may be done on the left. The prognosis in such cases is bad. In cases in which there is communication with the genito-urinary passages, operation may be postponed until the child is strong and able to stand the operation. The character of the feces is such that as a rule no obstruction is caused.

LESLIE, Evanston, Ill.

PSEUDO-APPENDICITIS: CRISES OF ACETONEMIA. GLORIEUX, Arch. méd. belges **88**:265 (Dec.) 1935.

Glorieux cites a number of cases of apparent crisis of acute appendicitis, mostly in children of about 8 years of age, in which the pain was not definitely localized and in which an excess of acetone appeared in the urine. Operation was accordingly postponed, and the delay was justified by speedy recovery under medicinal treatment consisting of sugar (20 to 30 cubes dissolved in a little water) and the free administration of sodium bicarbonate. The first stage of acidosis is manifested by the appearance of acetone in the urine accompanying the customary signs of prostration, vomiting and constipation, with diffuse or shifting abdominal pain. The appearance of diarrhea within a day or so of the beginning of alkaline treatment is the earliest indication of its success. Glorieux sounds a warning against a positive diagnosis in such cases unless the appendiceal lesion can be certainly defined.

VINTON, New York.

CLINICAL CONSIDERATIONS AND THE THERAPEUTICS OF GASTRIC INTOLERANCE IN NURSLINGS. L. TIXIER and R. DAUNAY, Arch. de méd. d. enf. **39**:201 (April) 1936.

A case of unusually obstinate anorexia following antidiphtheritic vaccination which was finally corrected by gastric lavage is reported. Although this observa-

tion was made in 1928, Tixier and Daunay deferred publication in order to determine whether recovery was complete and permanent.

In discussing the etiologic factors the conclusion is reached that, with the neuro-arthritic heritage which obtained in this infant, the reaction of the organism to the usually harmless injection of anatoxin was sufficient to accentuate latent morbid tendencies. In appraising such influences on the very young, Hutinel was wont to remark that "infants fall in the direction they are leaning."

After the child had lost more than a third of its weight, and when medication and management of every sort had signally failed, lavage with Vichy water was practiced twice daily, and the patient progressed rapidly to recovery.

AMESSE, Denver.

THREE SUCCESSIVE FETUSES WITH LARGE UMBILICAL HERNIAS. H. PAUCOT and P. GELLÉ, Bull. Soc. d'obst. et de gynéc. **25**:296 (April) 1936.

A 26 year old mother delivered a macerated fetus with a large umbilical hernia containing the fetal intestines. She became pregnant again four years later, and, although her serologic reactions were negative, she was given sporadic antisyphilitic treatment. At term a fetus was delivered which had an umbilical hernia that amounted practically to umbilical eventration. The infant was operated on at once but soon died. Two years later the mother again became pregnant and again was given intensive antisyphilitic treatment. At six and a half months hydramnion developed, and a dead fetus was expelled which had an umbilical hernia similar to those described. The authors could not find in the literature a report of similar successive umbilical hernias.

GLASER, Rochester, N. Y.

SEVERE ACID DIARRHEA. E. BOEGNER, Nourrisson **24**: 9 (Jan.) 1936.

An infant born six weeks permaturely and weighing 2,550 Gm. at birth acquired diarrhea with acid stools on the fourth day while receiving a mixed diet of breast milk and condensed milk. In spite of alkaline therapy and various formulas, this diarrhea continued with intermissions for three months. One examination of the stools showed a $p_H$ of 4.4 compared to a normal of from 5.5 to 6.4 for the stools of a baby receiving breast milk only. The diarrhea finally yielded to large doses of calcium carbonate and a casein milk diet.

MCCLELLAND, Cleveland.

HABITUAL VOMITING IN INFANTS. A. B. MARFAN, Nourrisson **24**:17 (Jan.) 1936.

After infants with organic anomalies of the gastro-intestinal tract, such as pyloric stenosis and duodenal bands, are ruled out, there remain numerous others for whom no effective explanation of habitual vomiting can be found. Roentgen studies show that many of these infants are air swallowers. If the infants are given feedings of thick liquids, much less air is swallowed and the vomiting disappears or becomes much less severe. Several other causes of habitual vomiting, for example, overfeeding, are discussed briefly.

MCCLELLAND, Cleveland.

FAVISM. P. PALOMBI, Riv. di clin. pediat. **34**:324 (April) 1936.

Favism is an acute illness due to beans and found most frequently in Italy, Sicily, Sardinia and Spain. The symptoms may be caused by the smelling of the flower, the picking and preparing of the beans or the eating of the beans. Palombi describes two cases that occurred in the Island of Elba. The patients were children 2 years of age who had eaten uncooked beans. The mother and the grandparents of one of the children had had similar attacks of favism. The symptoms, which came on suddenly, were headache, semicoma, vomiting, constipation, weakness of the muscles, pallor, jaundice and hemoglobinuria. Within a day or so the red blood cell count dropped to as low as 1,100,000. There was

leukocytosis. The patients recovered from the acute symptoms in about two days and from the anemia after about one month.

Several theories exist as to the cause of the disease. The illness may be due to a toxin present in the bean, or it may be an anaphylactic manifestation. The hereditary character of the susceptibility suggests that the illness is an inherited anaphylactic reaction. The treatment is symptomatic; blood transfusions are indicated. The mortality in all cases recorded in the literature is only 8 per cent.

HIGGINS, Boston.

DIARRHEAS IN INFANCY. LEONEL GONZAGA, Arch. de pediat., Rio de Janeiro **7**:155 (Jan.) 1936.

Gonzaga discusses causes, types and treatment of diarrhea in infancy.

SANFORD, Chicago.

PURULENT HEPATITIS DUE TO STAPHYLOCOCCIC INFECTION. CARLOS M. BARBEROUSSE, Arch. de pediat. d. Uruguay **7**:28 (Jan.) 1936.

Barberousse reports the occurrence of purulent hepatitis in an infant 3 years of age. It followed an attack of bloody dysentery lasting twenty days. The liver was painful, enormously enlarged and presented many nodules.

At autopsy generalized suppurative hepatitis was noted. The liver was honeycombed with abscesses. Culture revealed staphylococcus with no other organism. The biliary passages and the portal vein were free from lesions. The bowel showed a moderate degree of enterocolitis.

SCHLUTZ, Chicago.

MULTIPLE HEPATIC ABSCESSES AND GANGRENOUS DIAPHRAGMATIC PLEURISY FOLLOWING SUPPURATIVE APPENDICITIS. JOSÉ BONABA, Arch. de pediat. d. Uruguay **7**:33 (Jan.) 1936.

A child aged 6 years had complications after suppurative appendicitis, which had been undiagnosed for some time. Hepatic symptoms developed in the third month of the illness and began with pain over the region of the liver and severe vomiting of purulent fetid material. Death occurred two weeks after the onset of these symptoms. At autopsy purulent involvement of the appendix, multiple hepatic abscesses, gangrenous diaphragmatic pleurisy and pulmonary abscess were noted.

SCHLUTZ, Chicago.

THE RECOGNITION AND TREATMENT OF INTESTINAL OBSTRUCTION. R. GOLDHAHN, München. med. Wchnschr. **83**:97 (Jan. 17) 1936.

The prognosis in intestinal obstruction depends more on how early operation is performed than on the operative technic. Most patients come to operation too late. One should not wait for the classic picture of ileus to develop. Goldhahn discusses at length the methods of surgical procedure under various circumstances.

BRAHDY, Mount Vernon, N.Y.

A CASE OF MEGACOLON. J. K. JEN, Chinese M. J. **49**:1260 (Dec.) 1935.

A 3 year old boy was followed for one year after sympathectomy and showed functional recovery of the bowels, a reduction in the size of the abdomen and much improvement in health. There had been removal of the efferent visceral nerves connecting with the fourth, third, second and first lumbar ganglions and the sympathetic plexus of the inferior mesentery.

NEFF, Kansas City, Mo.

ACUTE INTESTINAL INTOXICATION IN INFANTS. A. D. YANG and A. WONG, Chinese M. J. **50**:390 (April) 1936.

Yang and Wong report an epidemic among newly born infants, involving ten in all, six of whom died. This disease followed a few days after a spell of hot

weather in Shanghai. It developed among infants who were not strong. Nearly all the infants were on mixed feeding. Extensive study of the food and care taken in the nursery ruled out decomposition or contamination of the milk. No pathogenic organisms were found in the stools or washings from the intestines or in cultures from the intestines of two babies on whom autopsies were done.

The symptoms were fever, diarrhea with from eight to fourteen stools daily and blood in the stool; some infants vomited; some had jaundice. There was no increase in the leukocyte counts. All the babies showed signs of dehydration, which was apparently not more marked in those who died. The treatment with fluids and transfusions was similar to that outlined by Brown and Boyd. No pathognomonic or characteristic pathologic lesions were found in the bowels. One infant had aspiration pneumonia. Another infant showed numerous changes outside the intestinal tract, such as would be expected with toxic causes.

The authors cannot place the cause of this epidemic. To an American this article recalls similar experiences of a generation ago when epidemics of diarrhea were common here. Fortunately such epidemics have nearly disappeared.

NEFF, Kansas City, Mo.

CONGENITAL ATRESIA OF THE ESOPHAGUS. B. BROMAN, Nord. med. tidskr. **11**: 566 (April 4) 1936.

Broman reports ten cases of esophageal atresia; in eight the condition was complicated with tracheal fistula. In two cases operation was tried but without result. The longest survivals were fourteen and sixteen days; the shortest, three and four days.

WALLGREN, Göteborg, Sweden.

SURGICAL TREATMENT OF INCARCERATED CONGENITAL DIAPHRAGMATIC HERNIA. H. PAABY, Ugesk. f. læger **98**:289 (April 2) 1936.

A boy aged 5 months fell acutely ill with vomiting and restlessness. One day later the heart was found displaced to the right, and roentgen examination disclosed on the left side a diaphragmatic hernia with a part of the colon projecting into the pleural cavity. Laparotomy was performed, the incarcerated part of the colon was replaced, and the opening in the diaphragm was closed by three catgut sutures. The infant was discharged healthy three weeks later, and at reexamination one month afterward he still enjoyed good health.

WALLGREN, Göteborg, Sweden.

## Nervous Diseases

FUNDAMENTAL EFFECTS OF EPILEPTOGENOUS AGENTS UPON THE CENTRAL NERVOUS SYSTEM. E. A. SPIEGEL and M. SPIEGEL-ADOLF, Am. J. Psychiat. **92**:1145 (March) 1936.

Recent physicochemical theories postulate that excitation of the nerve cell is brought about by changes in the hydrogen ion concentration on semipermeable surfaces by the production of a transitory increase in the permeability of the cell membrane. Studies in vivo and in vitro of permeability of cell surfaces for electrolytes, in which the polarizability of cerebral tissue (guinea-pigs) was measured, indicated that agents that produce cerebral edema by increasing the state of hydration of the cerebral tissue increase the permeability. This process is reversible. The experiments indicated also that swelling of the brain produces a lowered threshold for metabolic and other stimuli. This mechanism offers an explanation of the cortical excitation and convulsions associated with cerebral edema.

JAHR, Omaha.

ANTIRETENTIONAL THERAPY IN CONDITIONS ASCRIBED TO INTRACRANIAL LIQUID ACCUMULATION. EUGENE FOLDES, Am. J. Psychiat. **92**:1280 (May) 1936.

Convulsive states have one common factor which forms the underlying basis for the seizure—excessive fluid. Recent therapy seems to center along lines of dehydration. The author suggests that the best and most applicable procedure in these prolonged conditions is the one which produces the least discomfort, is the least trouble to follow and is the least costly. A dietary regimen is outlined, consisting essentially of a high protein intake, with special emphasis on the purine bases, a low carbohydrate and a moderate fat intake, limitation of fluid and restriction of salt. Good results were obtained on this regimen with a combination of the sedatives usually employed in these convulsive states. JAHR, Omaha.

INFANTILE AMAUROTIC FAMILY IDIOCY, WITH MEGALOCEPHALY AND CEREBELLAR ATROPHY. A. T. STEEGMANN and LOUIS J. KARNOSH, Am. J. Psychiat. **92**:1413 (May) 1936.

A Jewish infant born of parents with an unimportant family history developed normally for six months, when cessation of progress was noted. At this time there developed progressive atonia and visual impairment. These were followed by myoclonic excitement at 15 months, associated with general extensor hypertonus. There was no severe malnutrition at any time. At 19 months the infant was totally blind, and a cherry-red spot was found in the retina. When he was 21 months old the head began to increase enormously in size. Death occurred when he was 29 months old. The complete postmortem observations are recorded.

JAHR, Omaha.

TREATMENT OF CONVULSIONS IN CHILDREN. M. G. PETERMAN, Am. J. Psychiat. **92**:1433 (May) 1936.

The author presents a clinical classification of convulsions in childhood based on a series of five hundred cases. He emphasizes the importance of the underlying factors responsible for the seizures from the standpoint of therapy. The value of a ketogenic diet in idiopathic epilepsy is discussed. JAHR, Omaha.

THE LACTIC ACID CONTENT OF THE BLOOD AND OF THE CEREBROSPINAL FLUID. S. B. WORTIS and F. MARSH, Arch. Neurol. & Psychiat. **35**:717 (April) 1936.

The lactic acid content of the cerebrospinal fluid is normally from 7 to 27 mg. per hundred cubic centimeters. It is greatly increased in suppurative and tuberculous meningitis and in the presence of some tumors; it is slightly increased in syphilitic meningitis and in postconvulsive states. It is also slightly increased in catatonia and following violent exercise. BEVERLY, Chicago.

MENTAL CHANGES FOLLOWING HEAD TRAUMA IN CHILDREN. A. BLAU, Arch. Neurol. & Psychiat. **35**:723 (April) 1936.

Since there are records of only six cases of acute psychotic mental change after trauma to the head in children in ten years in the psychiatric division of the Bellevue Hospital, the condition is regarded as rare. All of these children had severe injury of the head, resulting in loss of consciousness. In four patients subjected to spinal puncture the fluid was bloody. One of the children showed no neurologic signs. The symptoms were those of severe disturbance in behavior—presenting a change in personality. There was acute excitement with unrestrained emotional outbreaks. All of the children except one who was removed against advice improved in from a few weeks to a few months.

Posttraumatic chronic disorders of behavior are similar to the postepidemic encephalitis syndrome. The prognosis is poor, and only occasionally is improve-

ment noticed. Twelve illustrative cases are described. The patients were free from neurologic findings and had changes in personality dating from the injury. In some cases x-ray pictures of the skull showed nothing abnormal, and the alteration in behavior was the only sign of injury. BEVERLY, Chicago.

GRAPHIC CHARTING METHOD FOR USE IN RECORDING SEIZURES OF PATIENTS WITH EPILEPSY. T. WHEELER, Arch. Neurol. & Psychiat. **35**:776 (April) 1936.

Wheeler describes a method for charting attacks of epilepsy in patients.

BEVERLY, Chicago.

EFFECT OF INCREASED OXYGEN PRESSURE ON THE SEIZURES OF EPILEPSY. W. G. LENNOX and A. R. BEHNKE, Arch. Neurol. & Psychiat. **35**:782 (April) 1936.

Decreased oxygen tension tends to precipitate, and increased oxygen tension tends to prevent, petit mal. BEVERLY, Chicago.

ENDOSCOPIC TREATMENT OF HYDROCEPHALUS: A DESCRIPTION OF THE VENTRICULOSCOPE AND A PRELIMINARY REPORT OF CASES. J. E. SCARFF, Arch. Neurol. & Psychiat. **35**:853 (April) 1936.

Scarff describes an instrument and a method for cauterization of the choroid plexus in obtaining relief from nonobstructive hydrocephalus.

BEVERLY, Chicago.

THE SENSE OF SMELL. C. A. ELSBERG, Bull. Neurol. Inst. New York **4**:535 (April) 1936.

In a series of forty-seven verified cases of tumor in or under the frontal lobes in which olfactory tests were made, the growth was localized by means of the tests in forty-six cases.

A small extracerebral growth below one frontal lobe affects the extracerebral olfactory pathways. A growth within the brain substance affects, in part, areas within the brain and, in part, extracerebral olfactory pathways. Blast injection and stream injection of odors aid one in localizing these tumors.

BEVERLY, Chicago.

SOME OBSERVATIONS CONCERNING THE RELATION OF HANDEDNESS TO THE LANGUAGE MECHANISM. E. C. CHESHER, Bull. Neurol. Inst. New York **4**: 556 (April) 1936.

Chesher studied 157 patients who had verified lesions localized in the language zone in the cerebral hemisphere of the side opposite to that of the preferred hand. All the patients showed aphasia. Nine patients constituting another group, whose condition revealed a mixed motor pattern and who used both hands, seemed to have a unilateralized language mechanism, so that a lesion on either side produced aphasia. Chesher emphasizes that the laterality of the language mechanism is subject to modification. Training may result in making both hemispheres functionally useful. There is a question, however, whether left laterality can be changed to right. BEVERLY, Chicago.

REMARKS ON THE EFFECTS OF ROENTGEN THERAPY UPON THE GLIOMAS. E. M. DEERY, Bull. Neurol. Inst. New York **4**:572 (April) 1936.

Deery described the effect of roentgen therapy on fifty gliomas of all types. Both preirradiation and postirradiation specimens of all the tumors were examined. The effect of irradiation varied in degree but involved primarly the tumor cells. The injury to some tumor cells was sufficient to cause their death.

Attempts to determine the relative sensitivity of various gliomas to roentgenotherapy should be based on a study of a far larger series of cases.

BEVERLY, Chicago.

DIETARY DEFICIENCIES AS THE ETIOLOGICAL FACTOR IN CERTAIN NEUROLOGICAL SYNDROMES. ORMAN C. PERKINS, J. Nerv. & Ment. Dis. **83**:505 (May) 1936.

In all the eighty-two cases of multiple neuritis studied, digestive disturbances of various degrees and types were constantly present. Dietary deficiencies were present, either because of lack of proper intake or because of an inability to assimilate certain necessary accessories. In symptomatology and pathogenesis the neuritic syndromes here studied compare favorably with those encountered in diseases due to definite vitamin deficiencies (beriberi, pellagra and sprue). The favorable therapeutic results obtained by the addition of various food factors speak strongly for a vitamin factor in these cases of multiple neuritis. While thus far only one vitamin is recognized as related to polyneuritis (B complex), the author suspects that other vitamins undoubtedly play an important rôle.

JAHR, Omaha.

THE MECHANISM OF PRODUCTION OF CEREBROSPINAL FLUID: A COMPARATIVE STUDY OF THE SUGAR, NON-PROTEIN NITROGEN, AND INORGANIC PHOSPHORUS CONTENT OF BLOOD AND CEREBROSPINAL FLUID. H. COHEN, Quart. J. Med. **5**:159 (April) 1936.

Cohen in a comparison of the blood and spinal fluid found no relationship between the sugar contents (thirty-one comparisons), the nonprotein nitrogen contents (thirty-three comparisons) and the inorganic phosphorus contents (twenty comparisons).

BRADFORD, Rochester, N. Y.

EFFECT OF INDUCED HYPERGLYCAEMIA ON THE GLUCOSE CONTENT OF CEREBROSPINAL FLUID. H. COHEN and J. LIBMAN, Quart. J. Med. **5**:169 (April) 1936.

Cohen and Libman have found that if the sugar in the blood is increased for a sufficient period, a significant rise in the sugar in the spinal fluid occurs.

BRADFORD, Rochester, N. Y.

THE GLUCOSE CONTENT OF CEREBROSPINAL FLUID AFTER WITHDRAWAL. H. COHEN and J. LIBMAN, Quart. J. Med. **5**:183 (April) 1936.

Provided the spinal fluid is not contaminated by bacteria, the sugar in it remains unchanged for an indefinite period after withdrawal.

BRADFORD, Rochester, N. Y.

ENCEPHALOGRAPHY IN THE INVESTIGATION OF CERTAIN CEREBRAL CONDITIONS IN CHILDHOOD: I. MEMBERS OF THE STAFF OF THE ROYAL ABERDEEN HOSPITAL FOR SICK CHILDREN, Arch. Dis. Childhood **11**:77 (April) 1936.

The technic of encephalography is given and the interpretation of encephalograms explained. The ventricles should be examined for size. An increase in size may be due either to an obstructive lesion that prevents the free egress of cerebrospinal fluid or to failure of the absorbing mechanism, so that the whole cerebrospinal circulation is stagnant. On the other hand, it may be compensatory, the result of an attempt to take the place of an atrophic area in the ventricular wall.

The size of the basal cisterns should also be noted. It is increased when there is failure of absorption of the cerebrospinal fluid.

The distribution of the pathways over the hemispheres should be studied to determine whether this is extensive (for example, encroaching on the occipital lobe) or partly absent, as in areas of adhesive leptomeningitis. The width of the pathways over the hemispheres should be noted. Normally it is about 3 mm. When convolutional atrophy is present, the width may be greatly increased.

KELLY, Milwaukee.

THE BLADDER FUNCTION IN SPINAL INJURY. K. H. WATKINS, Brit. J. Surg. **23**:734 (April) 1936.

The innervation of the bladder is chiefly from the third and fourth sacral segments. Destruction of these segments will alone, in most cases, completely cut off the bladder from its innervation by the pelvic and pudic nerves and leave it with its sympathetic (hypogastric) innervation only. By measuring the pressure within the bladder Watkins was able to determine the activity of the pubovesical muscle and the part played by the abdominal muscles in emptying the bladder. The method is described. He found that the contraction of the pubovesical muscle is very powerful and promotes an intravesical pressure much greater than that which can be achieved by straining with the abdominal muscles alone. There is associated relaxation of the sphincter muscles.

He cites and discusses cases of lesions of the conus terminalis and cauda equina and complete transverse lesions of the spinal cord. In a study of these cases, the importance of the active sacral spinal segments for proper functioning of the bladder is shown. The influence of these segments when a complete transverse lesion has occurred above them is such as to promote a perfect reflex micturition, which differs from the normal essentially in its entire independence of voluntary control.

The behavior of the bladder in the presence of lesions of the conus and cauda equina is evidence that function is to a limited degree mediated by the peripheral nerve ganglions. It has, however, been shown in the foregoing matter that this degree of function is not of itself efficient in evacuating urine from the bladder. For even when the internal sphincter is widely relaxed and the pubovesical muscle in contraction there may be no escape of fluid from the bladder. It can be concluded, therefore, that the peripheral innervation alone determines only a very ineffective function of the bladder.

It is without doubt the considerable mechanical resistance in the region of the triangular ligament which deprives this function of the bladder of most of its effect. But it is that resistance, combined with the patient's ability to expel urine by straining with his abdominal muscles, which provides him with the means of living in relative comfort. This patient is, therefore, in much better circumstances than the patient with a transverse lesion of the spinal cord, who, though he has very perfect reflex micturition, is not able to control it.

SUMMERFELDT, Toronto, Canada.

HYDROCEPHALUS ASSOCIATED WITH ANEMIA: RECOVERY. B. B. BHATIA, Brit. M. J. **1**:60 (Jan. 11) 1936.

An interesting case is reported in which a child first presented symptoms of hydrocephalus well after birth; when Bhatia examined the infant it had a marked anemia. Feeling that nothing could be done for the hydrocephalus, he treated the anemia, and as the condition improved, the size of the head subsided. He reports a final apparently complete recovery from all signs and symptoms of hydrocephalus.

ROYSTER, University, Va.

PROGRESSIVE FAMILIAL HYPERTROPHIC NEURITIS. E. L. COOPER, Brit. M. J. **1**: 793 (April 18) 1936.

Cooper discusses this condition and reports four cases. He gives a chart of the family incidence of the disease.

ROYSTER, University, Va.

THE EPILEPTIC FIT AND THE EPILEPSIES: CLINICAL RECOLLECTIONS AND REFLECTIONS. E. BRAMWELL, Edinburgh M. J. **43**:220 (April) 1936.

It was formerly the custom to speak of epilepsy, but at present one speaks of epilepsies, for the reason that there are varieties such as pyknolepsy, epilepsy

due to cysticercosis and possibly other epilepsies which will yet be differentiated from the common lot when more is learned about the pathologic processes.

Pyknolepsy is idiopathic. It is not rare. It is found in the age period from 3 to 12 years and stops definitely and permanently at puberty. The attacks are frequent and similar to those of petit mal. There is no mental impairment. The disease is not influenced by the usual drugs effective for epilepsy. Phenobarbital and the bromides are used. Administration of the drugs must be continued until the habit is broken. There is no untoward influence from continuous use of phenobarbital, even for many years. The administration must be stopped not suddenly but by gradual reduction. The dosage is from 1 to 1½ grains (from 0.064 to 0.096 Gm.) from one to three times a day. Phenobarbital sodium, the soluble salt, may be found better if used as a substitute when there are erythematous rash and itching. The bromides are of benefit either with phenobarbital or alone. A rash is usually prevented by the addition of 1 minim (0.061 cc.) of solution of potassium arsenate (Fowler's solution) to each 10 grains (0.64 Gm.) of bromide.

Relatives should keep a record of the exact date and hour of each attack, the observation of any exciting factor and the changes in treatment, as it is only by experiment that the benefit of treatment can be learned.

NEFF, Kansas City, Mo.

LATE ETHER CONVULSIONS. R. F. WOOLMER and STEPHEN TAYLOR, Lancet **1**:1005 (May 2) 1936.

True convulsions occur only after full anesthesia has been established and must be differentiated from ether clonus, which occurs in the early stages of anesthesia.

The authors believe that ether anesthesia upsets the normal heat-regulating mechanism of the body, and they concur with Dickson Wright's opinion that heat stroke plays a big part.

By way of prophylaxis they caution against the preoperative use of atropine in excess of 1/150 grain (0.43 mg.) in children and against the use of excessive coverings.

LANGMANN, New York.

TORULOSIS, WITH A REPORT OF A CASE OF MENINGITIS DUE TO TORULA HISTOLYTICA. W. C. SAWERS and E. F. THOMSON, M. J. Australia **2**:581 (Oct. 26) 1935.

Sawers and Thomson report a case of leptomeningitis caused by Torula histolytica, a species of yeastlike fungus, which reproduces by budding alone and does not produce endospores or a mycelium. Investigation of the organism isolated from this patient showed it to be pathogenic for mice and rats and to a limited extent for monkeys but not for guinea-pigs or rabbits. The pathologic lesions produced in laboratory animals are similar to those occurring in man. Pathologically the disease resembles infectious granuloma, and it is often difficult to distinguish it from a tuberculous infection. In fact, it may be almost impossible to make such a distinction unless the organism is found. Clinically, in recognized cases, torulosis usually involves the central nervous system. The pulmonary system is the next most often affected, and often these two systems are affected together. The establishment of a final diagnosis is necessarily a laboratory function, and unless the possibility of such infection is borne in mind, the microscopic appearance of preparations from the cerebrospinal fluid may be overlooked and the presence of yeastlike colonies on cultivation may be attributed to contamination.

GONCE, Madison, Wis.

A CASE OF LYMPHOCYTIC MENINGITIS WITH RECOVERY BUT FOLLOWED BY LATE PARALYSIS OF THE MUSCLES OF THE NECK. S. GRACOSKI and MICHAEL CAMNER, Bull. Soc. de pédiat. de Iasi **6**:56 (April-June) 1935.

The symptoms of meningitis, convulsions and opisthotonus occurred in a child 5 months of age. An increase in lymphocytes in the spinal fluid was noted. The

child apparently recovered completely, but several weeks later showed weakness of the muscles of the neck and was unable to hold up the head. The authors pose the question whether this might be an unusual form of poliomyelitis.

LESLIE, Evanston, Ill.

ETIOLOGY OF INFANTILE CONVULSIONS. G. HEUYER, C. VOGT and M. NICOLAS, Rev. neurol. **64**:486 (Oct.) 1935.

In the discussion of epilepsy at the International Neurological Congress, Heuyer, Vogt and Nicolas reported 239 cases of infantile convulsions, with their relations to epilepsy. One hundred and fifty of the infants had convulsions before the age of 2 years, and 150 after the age of 3 years. Forty per cent showed recurrence of convulsions after the age of 2 years. In 89 cases epilepsy developed without preceding "infantile convulsions." Another 89 showed no epilepsy following infantile convulsions, but the authors point out various neurologic diseases to which they were subject.

The study of etiology pointed to alcoholism or syphilis of the parents in many of the cases. Neuropsychoses, epilepsy, obstetric trauma, tuberculosis and encephalitis accounted for smaller numbers. They conclude that neuropathic inheritance does not create epilepsy, but it does indicate a lowered resistance of the nervous centers.

DAFFINEE, Boston.

BLOOD CHEMISTRY FINDINGS IN EPILEPTIC PATIENTS. C. I. PARHON and G. WERNER, Rev. neurol. **64**:492 (Oct.) 1935.

Blood changes were studied in fifteen epileptic women. The values for protein and fat were diminished in nearly all cases.

The average figures are given:

| | | | |
|---|---|---|---|
| Protein | 59.15 | Fat | 4.27 |
| Protein/fat ratio | 14.32 | Cholesterol | 1.42 |
| Sulfate | 0.119 | Chloride (total) | 2.86 |
| Alkaline reserve | 64.3 | Chloride (plasma) | 3.84 |
| Calcium | 0.097 | Potassium | 0.178 |
| Magnesium | 0.016 | Sodium | 3.43 |

DAFFINEE, Boston.

STUDY OF THE LACTIC ACID CONTENT OF THE CEREBROSPINAL FLUID, WITH COLLATERAL OBSERVATIONS OF SOME OTHER CHEMICAL COMPONENTS. I. BIDDAU, Clin. pediat. **18**:173 (March); 193 (April) 1936.

After a very complete review of the literature relating to the lactic acid content of the cerebrospinal fluid, Biddau describes the technic of the qualitative test for lactic acid introduced by Geldrich. He reports the results of examination of 245 specimens of spinal fluid from 136 patients.

In specimens from 29 children ranging in age from 7 months to 13 years and suffering from a wide variety of conditions in no way suggesting involvement of the central nervous system, the test for lactic acid was negative. In specimens from 24 children with meningism in the presence of various acute infections not involving the central nervous system, the test was negative. It was positive, however, in specimens from 17 of 20 children with tuberculous meningitis. In specimens from 15 children with meningococcic meningitis, the test at first was positive, but in specimens from the 13 who survived the disease it became negative after the acute phase had subsided. It appears that the development of a negative reaction to the test for lactic acid in the course of this disease is of more immediately favorable prognostic significance than changes in the protein, the disappearance of bacteria or even changes in the cell counts. In specimens from 9 children with purulent meningitis of other types the test was positive. The test was not positive in

specimens from 39 children who had various other neurologic conditions, including encephalitis, serous meningitis, intracranial hemorrhage, tumor of the brain, Little's disease, poliomyelitis, epilepsy and hydrocephalus.

These findings are correlated in extensive tables giving data also on the appearance of the spinal fluid, the pressure, the albumin, chloride and dextrose contents and the sediments, together with brief clinical notes.

DOOLEY, New York.

CLINICAL IMPORTANCE OF LACTIC ACID IN THE CEREBROSPINAL FLUID OF CHILDREN. A. CRISTOFOLI, Clin. pediat. **18**:213 (April) 1936.

Cristofoli made simultaneous determinations of the lactic acid and the dextrose in the spinal fluids of thirty-one children. When conditions are normal, the amounts of lactic acid in the spinal fluids of children between the ages of 2 and 8 years are between 11.5 and 26 mg. per hundred cubic centimeters. In poliomyelitis, the lactic acid is diminished, while the dextrose is elevated or is at the upper limits of normal. In tuberculous meningitis, the lactic acid is as much as 64 mg., while the dextrose may fall to 11 mg. In purulent meningitis, the lactic acid may be as high as 38 mg., while the dextrose may fall to 0.8 mg. In one child with aseptic purulent meningitis (and thrombosis of the cavernous sinus) the lactic acid content of the spinal fluid was 14.5 mg. and the dextrose content 96 mg. One questions whether the author's material was sufficient to warrant his conclusions.

DOOLEY, New York.

DISTURBANCE OF PSYCHE AND OF CHARACTER IN THE SYNDROME OF CHOREA. A. SIMONINI, Clin. pediat. **18**:242 (April) 1936.

Simonini states that psychic disturbances are not uncommon in the course of chorea but that they usually subside rapidly after the acute phase is over. He briefly notes the cases of two children who had chorea associated with acute rheumatic fever at the ages of 6½ and 8 years, respectively. They still had severe disturbance of behavior four years later, apparently without mental deterioration.

DOOLEY, New York.

CEREBELLAR TUMORS IN CHILDREN WITH NEARLY NORMAL FINDINGS FOR THE SPINAL FLUID. PAUL VON KISS and ISTRÁN FÉNYES, Arch. f. Kinderh. **108**:71 (May 10) 1936.

Three cases of cerebellar tumor in which there were nearly normal findings for the spinal fluid are reported.

CRANE, Chicago.

THE TOMOGRAPHIC TECHNIC IN THE VISUALIZATION OF THE FLUID-CONTAINING SPACES OF THE BRAIN. R. JANKER, Fortschr. a. d. Geb. d. Röntgenstrahlen **53**:699 (April) 1936.

The tomographic method of roentgenographic examination has proved its worth in differentiating pulmonary shadows, in detecting cavities which might otherwise escape notice and in establishing the diagnosis of bronchiectasis without the use of contrast mediums. Janker reports experimental and clinical observations which demonstrate that the technic may profitably be applied in encephalography and ventriculography. However, the evidence which he presents does not indicate that the results so obtained are in any way superior to those which may be gained by the use of stereoscopic roentgenography.

MCCUNE, New York.

INFLUENZA BACILLI AS A CAUSE OF MENINGITIS. E. BENDER and H. BRUNS, München. med. Wchnschr. **83**:557 (April 3) 1936.

The most frequent cause of acute suppurative meningitis is the meningococcus. From 1932 to 1935 Bender and Bruns observed 537 cases of meningitis. The causative agents were: the meningococcus in 71 per cent, the pneumococcus in

10 per cent, the tubercle bacillus in 5.7 per cent, a streptococcus in 6.3 per cent, a staphylococcus in 5.4 per cent and the influenza bacillus in 1.1 per cent. The authors emphasize the importance of careful bacteriologic examination in all cases of meningitis. Aural discharges and sputum should be examined. They report two cases of influenzal meningitis which terminated fatally. According to Rivers, the mortality rate in influenzal meningitis is 92 per cent.

BRAHDY, Mount Vernon, N. Y.

## Psychology and Psychiatry

FUNCTIONAL PSYCHOSES IN CHILDREN: AN ANALYSIS OF THE FINDINGS IN TWENTY CASES OF PSYCHOTIC CHILDREN STUDIED AT THE CHILD GUIDANCE HOME. LOUIS A. LURIE, ESTHER B. TIETZ and JACK HERTZMAN, Am. J. Psychiat. **92**:1169 (March) 1936.

Of one thousand children admitted to the Child Guidance Home twenty, varying in age from 5 to 17 years, were found to be definitely psychotic, thirteen having schizophrenia and six having a psychopathic personality and psychosis. Half the children were admitted because of delinquency. In eleven of the schizophrenic children the onset was acute. In those with a psychopathic personality the onset was gradual. All the twenty children studied presented a moral problem regarding some form of unacceptable behavior, and fifteen showed also intellectual arrest. Practically all these children had a history of social, emotional and intellectual difficulties, while their physical growth had been uneventful.

The prognosis in these cases is not encouraging. Only one of the children with schizophrenia and two of those with a psychopathic personality have made a good adjustment in the community.

According to the authors the prevailing impression that mental disease is comparatively rare among children is erroneous. If 2 per cent of the first thousand children with behavior difficulties presented definite psychotic states, the conclusion cannot be escaped that the incidence of mental disease among children is considerably greater than has hitherto been suspected. Bad behavior does not exclude the presence of psychosis.

JAHR, Omaha.

THE MENTAL FUNCTIONING OF EXCEPTIONAL CHILDREN. HARRIET BABCOCK, Contrib. Sc., 1936, p. 6.

The mental efficiency of children cannot be determined by mental age or intelligence quotient alone. Marked individual differences in the rate of forming associations, learning ability, ability to understand abstraction, motor control and other processes must be considered, if one is to understand the behavior of individual children in their scholastic efforts.

BEVERLY, Chicago.

THE THERAPEUTIC SIGNIFICANCE OF THE MECHANICAL ANALYSIS OF MOTOR HANDICAPS. WINTHROP MORGAN PHELPS, Contrib. Sc., 1936, p. 14.

The term "cerebral palsy" should be used instead of "spastic child," because under the latter are several types of handicap differing both as to etiology and as to location of the lesion. The treatment and training must vary with each group and with the particular handicap of the individual child.

BEVERLY, Chicago.

THE RÔLE OF THE FORGETTERY IN EDUCATION. IRA S. WILE, Contrib. Sc., 1936, p. 21.

Wile presents a rather long and theoretical but excellent article on the psychology of forgetting. It cannot be well summarized. It should be read in its entirety.

BEVERLY, Chicago.

MODIFICATION OF INFANT BEHAVIOR. MYRTLE B. MCGRAW, Contrib. Sc., 1936, p. 45.

McGraw describes an experiment with twins started shortly after birth, one being given intensive practice in certain performances and the experiences of the other in those performances being restricted. The purpose of the experiment was to ascertain at what time in the life of a person his behavior performances are modified through practice. She concluded that it is not safe to say that there is any one period which is most significant for growth and development. Periods vary with different persons.

BEVERLY, Chicago.

EMOTIONAL PROBLEMS IN CHILDREN. LAURETTA BENDER, Contrib. Sc., 1936, p. 49.

Bender describes the work in the children's ward at the Bellevue Psychopathic Hospital in observing and studying emotional problems. She especially emphasizes that the practical conclusion of the psychoanalytic school should be adopted and used.

BEVERLY, Chicago.

PERSONALITY DEVELOPMENT IN MENTALLY HANDICAPPED CHILDREN. THOMAS H. HAINES, Contrib. Sc., 1936, p. 65.

Haines points out that in association with mental handicap of the child there is a slowness of development and that this must be taken into consideration in his management.

BEVERLY, Chicago.

A STUDY OF MENTAL CONFLICT IN DELINQUENT AND NON-DELINQUENT BOYS. H. MAX HOUTCHENS, J. Juvenile Research **19**:180 (Oct.) 1935.

Houtchens has carefully worked out a technic to demonstrate the presence of emotional conflict as is shown by word associations. With this method he tested twenty delinquent and twenty nondelinquent boys. There was no significant relation between the intelligence quotient and the emotional disturbances. The conclusions otherwise require special knowledge of graphs and terminology, which makes them anything but clear.

HAMILL, Chicago.

RELATIONSHIPS BETWEEN INTELLIGENCE, ACHIEVEMENT AND MUSICAL TALENT. VERNE R. ROSS, J. Juvenile Research **20**:47 (April) 1936.

A mathematical examination into the relationships between intelligence and musical talent was made for 1,541 children in the fifth to twelfth grades in several school systems of southern California. Musical talents included sense of pitch, intensity, time, consonance, memory and rhythm. A significant relationship to achievement in reading was seen in pitch, consonance and memory; to achievement in arithmetic in tonal memory, and to composite achievement in pitch, intensity, consonance and tonal memory. However, in general, pupils with superior musical ability showed also superior intelligence and scholastic achievements. Deficiency in musical talent has a definite relation to inferiority in intelligence and scholastic achievement.

HAMILL, Chicago.

USE OF THE BERNREUTER PERSONALITY INVENTORY AS AN AID IN THE PREDICTION OF BEHAVIOR PROBLEMS. GEORGE S. SPEER, J. Juvenile Research **20**:65 (April) 1936.

There appeared to be no significant difference between groups of problem and of nonproblem children when classified according to the Bernreuter personality inventory. A comparison was made of children of the ninth to twelfth grades. The group of problem children consisted of fifty-four referred because of maladjustment, stealing and other features; the other group consisted of 185 normal children.

HAMILL, Chicago.

How Psychiatric Services Are Being Utilized by Schools of New York State. Frederick L. Patry, New York State J. Med. **35**:1101 (Nov. 1) 1935.

School physicians in New York are urged to take advantage of the services provided by the Department of Mental Hygiene in its child guidance clinics. Psychiatric and psychologic services, mental retardation, conditions requiring intelligence tests, maladjustment, speech defects and any troublesome behavior problems are given special study in these clinics. Aikman, Rochester, N. Y.

Objectives of the Conference. Clarence M. Hincks, Proc. Conf. Psychiat. Educ., 1936, p. 1.

"Those of us who are particularly interested in work for the conservation of the mental health of our people are convinced that progress in this direction will be limited unless we can count upon the whole-hearted, intelligent cooperation of the medical profession." To this end the teaching of psychiatry in medical schools is essential.

The support of the Commonwealth Fund and of the New York Foundation has been obtained for fostering better arrangements for training in psychiatry and mental hygiene in medical schools.

At this, the third annual conference on psychiatric education, attention was given to psychiatric education in the setting of pediatrics. Beverly, Chicago.

Contributions of the Pediatrician and the Psychiatrist to the Teaching of the Principles Involved in the Preservation of Mental Health. Frank H. Luton, Proc. Conf. Psychiat. Educ., 1936, p. 63.

The psychiatrist is in the background. He occupies a position between the department of pediatrics and the department of preventive medicine and tries to supplement their efforts to teach physicians to treat patients and to prevent illness. The psychiatrist has had more training in the prevention of personality disorders, the pediatrician in the prevention of disease. At Vanderbilt University an attempt is made to give the combined views to medical students.

Beverly, Chicago.

Behavior Pattern and Behavior Morphology. Arnold Gesell, Science **81**:15 (Jan. 4) 1935.

The essence of this article is: "At 24 weeks the infant contacts the pellet with pronate hand, in a pawlike manner, with no finger adjustments. At 28 weeks he flexes his fingers upon the pellet. At 32 weeks he grasps it by a simultaneous raking flexion. At 36 weeks he grasps it between thumb and index. At 40 weeks he approaches and contacts the pellet with extended index. He pokes and pries with his index. This poking projection of the index is a pattern characteristic so well defined that at 40 weeks it is almost as plain as the nose on his face. It is a new form of behavior, and like the profile of his nose, it is an intrinsic morphogenetic product."

The author is verbose and vague concerning "form." He states: "The form characteristics of behavior pattern can be investigated in their own scientific right." Of course they can, but the superfluous word "form" is dragged in here to support the following specious argument that such investigations have to do with "morphology." This term is used inaccurately and unjustifiably throughout the paper to indicate change of position, variation in sequence of muscular movements, behavior pattern, etc. Poetic license is all very well in its place, but in science terms must be specific. A dancing master may teach "good form," but that is no reason why departments of anatomy should take up choreography!

Cobb, Boston. [Arch. Neurol. & Psychiat.]

THE SIGNIFICANCE OF THE RORSCHACH TEST. P. E. VERNON, Brit. J. M. Psychol. **15**:199, 1935.

The Rorschach ink blot test has been considered an objective, empirical test, like the standard psychometric tests. It should be used as a psychodiagnostic instrument of the play technic type. The Rorschach test is compared to other clinical psychodiagnostic methods, such as handwriting, creative play and drawings, the Porteus maze test and the mosaic test.

The Rorschach test should help in studies of the nature and organization of personality, character type, mental disorders and the relation of artistic style to personality. It is of more value in the psychoneuroses than in the psychoses. It contains real possibilities in child guidance and vocational guidance of adolescents. It is not as suitable as drawings or creative play for young children.. The majority of children are so restricted in their response that little can be deduced beyond estimates of their general intelligence and emotional instability. Unusually imaginative children or children from a more cultured background and those with definite neurotic or psychotic tendencies may reveal more.

BUDSON, Detroit.

A REPORT OF ATTEMPTS TO PRODUCE UNIOCULAR BLINDNESS BY HYPNOTIC SUGGESTIONS. FRANK A. PATTIE JR., Brit. J. M. Psychol. **15**:230, 1935.

None of the five subjects used by Pattie showed any genuine blindness when tested with adequate malingering tests, but they exhibited differences in their reactions to the suggestion of blindness. This would seem to cast doubt on the possibility of producing by suggestion such an interruption of functional continuity in the nervous system as will produce blindness.

BUDSON, Detroit.

MOTOR DISTURBANCE IN THE NORMAL AND THE ABNORMAL CHILD. G. HEUYER and J. ROUDINESCO, Arch. de méd. d. enf. **39**:265 (May) 1936.

In this exhaustive thesis an attempt is made to demonstrate a parallelism between motor disturbances and intellectual deficiencies. These anomalies are shown to manifest themselves again in the psychomotor phenomena of various disorders in later life. The importance, therefore, of a thorough understanding of the various stages in the motor development of the normal infant and the urgent need for intervention when there is any deviation from this pattern are suitably stressed. Amelioration in the domain of motor disturbances may be followed by a corresponding improvement in the mental processes, and from a practical point of view it is essential to afford a place for motor education beside that of pedagogic instruction. For retarded children the authors recommend rhythmic gymnastics to diminish the hypertonia or the paratonia and to secure better static or dynamic coordination. Manual training should follow.

AMESSE, Denver.

A PROCESS FOR EVALUATING ABILITY TO LEARN. A. REY, Arch. de psychol. **24**: 297, 1934.

Rey makes a strong point of the advisability of comparing persons for their ability to learn rather than for their accomplishment, noting that similarity in accomplishment or present performance may not mean similarity in mental ability if the persons in question are not comparable in their previous experiences. His test of the ability to learn consists of a series of three boards, each containing nine disks, all but one of which are movable. The subject has to learn to point correctly to the disk which is not movable. Rey gives norms for children, based on a study of eighty subjects, and compares the qualitative differences in performance at different ages. He then discusses certain qualitative characteristics of the learning ability of adults with various abnormal mental conditions. From

the results obtained with the subjects studied, he concludes that the test is better than the usual memory exercises in detecting abnormalities of memory in such conditions. He notes, however, that the test shows only one type of memory and that other tests should be devised for other types of memory, notably, for memory for verbal material. McBride, Philadelphia. [Arch. Neurol. & Psychiat.]

Studies on Language in the Child. André Ombredane, Hyg. ment. **30**:69 (April) 1935.

The cry of the new-born infant is a local manifestation of a generalized reaction of defense, tonic in character. The first lallings bear the stamp of a tonic activity. They occur under conditions of resistance to the infant's reactions or with movements giving an attitude of hyperextension. They may be looked on as tonic postural reflexes. Occlusion of the glottis is a primary element of all these reactions of generalized muscular tension. Gradually labial phenomena become more important, and as their dominance commences, the period of cortical functioning sets in. Imitation is now the order of the day; the guttural phenomena occurring in this stage are not the same as the glottic lallings of the earlier tonic period.

Anderson, Los Angeles. [Arch. Neurol. & Psychiat.]

On the Differential Diagnosis for the Child Who Does Not Talk. Gertrud Lasch, Arch. f. Kinderh. **108**:78 (May 10) 1936.

A report of a case illustrates the importance of a therapeutic test in the diagnosis of psychogenic failure to talk. This test was made by having the investigator in close association with the child for a considerable period. Having first gained the child's confidence, she was able by repeated attempts to focus the child's attention on sounds and eventually to induce her to repeat simple sounds and then words.

Crane, Chicago.

Relationship Between Fatal Epileptic Seizures and Meteorological Conditions. Irene Bruckmüller, Ztschr. f. d. ges. Neurol. u. Psychiat. **151**:691 (Dec.) 1934.

Fifty-one patients with essential epilepsy uncomplicated by other general diseases were studied in relation to the beginning of the fatal epileptic seizures and atmospheric conditions. Twenty-seven of the seizures occurred with cold and ten with warm winds. It is believed that there is a definite relationship between the fatal attack and the atmospheric changes, especially cold winds, and that meteorological factors play a rôle in precipitating nonfatal epileptic attacks.

Michaels, Boston. [Arch. Neurol. & Psychiat.]

## Diseases of the Genito-Urinary Tract

Orthostatic Albuminuria in Homologous Twins. H. J. Bakst, W. Wetherbee Jr. and J. A. Foley, New England J. Med. **214**:832 (April 23) 1936.

There have been many reports of various diseases occurring simultaneously in homologous or identical twins, but a careful review of the literature has failed to disclose any report of orthostatic albuminuria in identical twins, so the authors report on two brothers aged 19 years who were singled out in examinations for the Citizen's Military Training Corps.

In each case the history and the results of physical examination were negative, the blood was normal and the tests of renal function and the urinalyses showed no abnormalities save for transient albuminuria; also, x-ray pictures showed the kidneys, ureters, bladder, gastro-intestinal tract and dorsolumbar region of the spine to be normal, and pyelograms showed no alterations.

Gengenbach, Denver.

TREATMENT OF HYPOSPADIA IN THEORY AND PRACTICE. H. CABOT, New England J. Med. **214**:871 (April 30) 1936.

The requirements of successful correction of hypospadia are twofold: first, correction of the almost always present deformity of curvature and, second, construction of a satisfactory urethral canal.

The correction of the deformity should be undertaken very early in the life of the patient, probably at or before the age of 2 years. A considerable interval, at least three or four years, should then be allowed to elapse before the construction of a urethra is undertaken. Detailed descriptions of various procedures for correcting the deformity of curvature and constructing a urethra are given.

GENGENBACH, Denver.

UROLOGICAL SURGERY IN CHILDREN. HERMAN L. KRETSCHMER, Wisconsin M. J. **34**:832 (Nov.) 1935.

Urologic exploratory operations in pediatric practice have almost disappeared owing to increasing diagnostic accuracy. The number of patients with chronic pyuria and much secondary damage has also decreased because of more prompt urologic study.

Malignant tumor, which is rare in childhood, occurs in greatest frequency in the kidney (the adenomyosarcoma) and in the eye. When treated with roentgen rays before operation, they diminish markedly in size, making nephrectomy easier and reducing the rather high mortality. Urinary stones are uncommon.

Tuberculosis of the genito-urinary tract in childhood may be divided into acute miliary tuberculosis of the kidney and chronic surgical tuberculosis. The latter is rare partly because those with extensive involvement in youth die owing to lack of specific resistance and partly because of the decrease in the incidence of tuberculosis.

Congenital malformations, with obstruction, stasis and infection, form a large group. All persons with persistent pus and bacteria in the urine should have a careful urologic study, with the likelihood of finding an obstruction that can be corrected surgically, before there has been irreparable damage.

JANNEY, Wauwatosa, Wis.

THE INFLUENCE OF OESTROGENIC COMPOUNDS IN CAUSING HERNIA AND DESCENT OF THE TESTIS IN MICE. HAROLD BURROWS, Brit. J. Surg. **23**:658 (Jan.) 1936.

A series of 4,013 male mice of all ages were examined for the presence of scrotal hernia. Normally no scrotal hernia is present in mice. Various potent estrogenic compounds were administered. Of seventy-eight mice treated with theelin (estrone) scrotal hernia developed in forty-seven. It has been found in this experiment that the presence of a more or less mature testis is necessary for the formation of scrotal hernia under the influence of theelin, and, secondly, that theelin may prevent the descent of the testis and when this occurs the testis does not become mature. In young mice theelin may prevent the descent of the testis and hernia will not appear. It has also been found that only one testicle is necessary for the development of hernia on both sides under the influence of theelin. This was demonstrated by unilateral castration. In cases of bilateral castration, scrotal hernia does not develop on administration of the hormone. In some mice in which there has been a long-continued application of theelin there was a tendency to develop some resistance to the hormone. In a series of mice which were fed a vitamin-deficient diet no hernia was produced by administration of the hormone.

SUMMERFELDT, Toronto, Canada.

ENCRUSTATION OF THE BLADDER AS A RESULT OF ALKALINE CYSTITIS. H. G. LETCHER and N. M. MATHESON, Brit. J. Surg. **23**:716 (April) 1936.

Letcher and Matheson had a patient with generalized incrustation of the wall of the bladder. They define this condition as a more or less localized ulcerative

inflammation of the wall of the bladder, with deposits of calcium phosphate on the surface and in the walls of the ulcerations. The condition is caused by an implantation of Proteus ammoniae (Salmonella ammoniae) in a bladder which is already the seat of inflammation or of a tumor. The incrustations result from the breaking up of urea into carbon dioxide and ammonia, with the precipitation of alkaline inorganic salts.

The symptoms are those of severe chronic cystitis, often accompanied by hematuria and occasionally by the passing of calculous material. The urine is alkaline, cloudy and foul smelling. A definite diagnosis is made by cystoscopic examination.

Treatment consists in rendering the urine acid with drugs such as ammonium chloride. Prolonged acidification by means of the ketogenic diet has been beneficial. The benefits of irrigations of the bladder with acid solutions are usually transient. Vitamin therapy and administration of parathyroid have been found to be beneficial.

SUMMERFELDT, Toronto, Canada.

CARDIAC HYPERTROPHY IN EXPERIMENTAL NEPHRITIS. J. B. DUGUID, Lancet **2**:421 (Aug. 24) 1935.

Rats were fed a diet of bread and potatoes for from twenty to thirty days. Sodium biphosphate (5 parts per hundred of body weight) was added to the diet, and a daily dose of from 20,000 to 40,000 units of vitamin D in the form of calciferol was given by mouth.

Chronic nephritis is thus produced, the primary lesion being parenchymatous degeneration with focal calcification of the tubules. In severe involvement in which the animals survive two or more months after treatment, cardiac hypertrophy is observed. It takes the form of concentric thickening of the left ventricle. There is no evidence that arterial disease is concerned in the process. The cardiac hypertrophy is clearly the result of parenchymatous destruction.

LANGMANN, New York.

VULVO-VAGINITIS IN CHILDREN. P. A. TREAHY, New Zealand M. J. **35**:124 (April) 1936.

Treahy reports curing two patients of gonorrheal vulvovaginitis by using estrogen. The method consisted in daily douching with tincture of iodine, 1 drachm (about 4 cc.) to the pint (about 473 cc.) of warm water, combined with insertion of a cocoa butter suppository containing 100 rat units of the estrogenic substance, every night. This was carried out for one month; at the end of three weeks the discharge had stopped, and the smears showed no gonococci. The total dose was about 3,000 rat units.

MULHERIN, Augusta, Ga.

OPERATION ON POLYCYSTIC KIDNEY IN AN INFANT; CURE; NORMAL DEVELOPMENT OF THE INFANT. E. SORREL, Bull. Soc. de pédiat. de Paris **34**:215 (April) 1936.

An infant was operated on at the age of 2 months because of the presence of a large abdominal mass. A polycystic kidney was found and removed. The infant made an uninterrupted recovery and was shown fourteen months later as a normally developed child. The condition is rarely encountered in the new-born, and when it is present, the infant usually soon dies. Therefore, there is a good deal of interest in this presentation, as well as in the future course of the child.

BENJAMIN, Montreal, Canada.

HEREDITARY DIABETES INSIPIDUS. CORNELIA DE LANGE, Jahrb. f. Kinderh. **145**:1 (July) 1935.

De Lange's interest in hereditary diabetes insipidus was stimulated by the opportunity to observe two children, whose family history showed the presence of

diabetes insipidus in four generations. In the limited time available for study of the two children, it was found that they had normal amounts of blood chlorides but were excreting abnormal amounts in the urine. The desirability of further study of these children is stressed.

A study of the literature reveals that the condition usually appears when the child is several years of age, although there are instances in which symptoms of unusual thirst were noted even as early as the new-born period. The symptoms usually become worse between 20 and 30 years of age and diminish from 50 onward. The symptoms are aggravated during pregnancy. Diabetes insipidus is not incompatible with long life. There are no reported pathologic studies on hereditary diabetes insipidus.

LANDAU, Hannibal, Mo.

BACTERIOLOGY OF PYURIA. GERHARDT JOPPICH, Monatschr. f. Kinderh. **65**:25, 1936.

Joppich examined 107 children with pyuria to determine whether the disease was caused by the specific type of colon bacillus described by Adam. He found instead organisms of nineteen different types. In only 10 of the 107 cases did the organism belong to the group described by Adam. The most common form was the one most frequently found in the intestine. Some of the colon bacilli were hemolytic, but this property had no relationship to the virulence. The type of organism frequently changed in the same child. He concludes that the colon bacillus is not the cause of the pyuria but plays a secondary rôle.

GERSTLEY, Chicago.

RENAL RICKETS. C. C. PI, Chinese M. J. **50**:399 (April) 1936.

Pi summarizes the reports of cases in the literature and adds his own report of a case observed in a Chinese girl 19 months old. The serum calcium was 7 mg. per hundred cubic centimeters of blood, which is about the average amount reported in other instances. At autopsy the kidneys were found to have the characteristic microscopic changes of chronic nephritis, while the osteochondral regions had the changes of rickets.

NEFF, Kansas City, Mo.

FREQUENCY, CAUSES AND TREATMENT OF ENURESIS IN ADULTS AND IN CHILDREN. S. KOSTER, Nederl. tijdschr. v. geneesk. **80**:1723 (April 18) 1936.

The estimations of various authors as to the frequency of enuresis in children vary from 1 to 10 per cent. An investigation was made by the author concerning the occurrence of enuresis in soldiers and in those reporting for medical examination for military service. He deduces from this inquiry that in the Netherlands about three thousand men and over fifteen hundred women suffer from enuresis. The various causes quoted by other investigators for this disorder are mentioned, but of these only too great depth of sleep is acknowledged by the author as an important factor. As to treatment, it is pointed out that this should be exclusively psychic, for with this the best results are obtainable. The author reports 98 per cent of recoveries with hypnosis. An abbreviated record is given of three typical cases.

VAN CREVELD, Amsterdam, Netherlands.

## Diseases of the Ductless Glands; Endocrinology

THE PREVENTION OF GOITRE IN WISCONSIN: A CHALLENGE TO THE MEDICAL PROFESSION. ARNOLD S. JACOBSON, Wisconsin M. J. **35**:15 (Jan.) 1936.

The incidence of goiter in Wisconsin is perhaps higher than that in any other state in the union. The state medical society has a committee studying the situation and the possibilities of eradication of goiter. Among Wisconsin's 552,312

school children, 1 of every 5 shows some evidence of disturbance of the thyroid gland. Only about 5 per cent are receiving treatment. The use of iodized salt carries little danger, even in the adult, of causing iodine hyperthyroidism.

Among 1,000 children who have had iodine for twelve years adenomatous goiter has not developed if it had not previously existed. The study also indicates that two or three times more iodine is needed than is the average (0.01 mg.) daily intake when iodized salt is used. This with the addition of thyroid therapy is required by many children to prevent the development of colloid adenomatous goiter. While iodized salt is valuable and the most effective known way of dissemination of iodine it would be wiser to dispense it in a more exact amount.

Physicians should take charge and promote the use of iodine in a definite manner in proper amounts for every child for ten years. If this were done, goiter and its serious consequences (cretinism, feeblemindedness and deaf-mutism) should in a large measure be checked. Otherwise, as the country becomes older, the severity and frequency of cretinism will approach that found in Europe and Asia.

JANNEY, Wauwatosa, Wis.

GOITRE IN NEW ZEALAND. C. E. HERCUS and H. D. PURVES, New Zealand M. J. **35**:83 (April) 1936.

After a short historical sketch of the recognition of goiter in New Zealand and an explanation of the difficulties encountered in interpreting the data from earlier records because of changing nomenclatures, Hercus and Purves present an exhaustive statistical study of their subject. The conclusions are: 1. There is a rising death rate, that in 1929 being nine times greater than that in 1889; there is a progressive increase with age up to 70 years, the ratio of females to males affected varying at different ages from 3 to 10.8. 2. The rate of the deaths from thyrotoxicosis increased by one and a half times between 1908 and 1934. 3. There is an increase in the mortality from goiter for New Zealand as a whole. 4. No province can be regarded as secure against the hazard of goiter. 5. There is no positive correlation to be detected between the incidence of goiter and malignant disease of the thyroid gland, the latter being extremely rare throughout New Zealand.

MULHERIN, Augusta, Ga.

STATUS THYMICO-LYMPHATICUS. HENRY COHEN, Practitioner **136**:252 (March) 1936.

This old medical problem, over which there has been so much controversy, is reviewed by Cohen. He notes that Paltauf, of Vienna, in 1889, maintained that enlargement of the thymus and vascular hypoplasia or hyperplasia of lymphatic tissue in general were frequent findings in cases in which sudden death occurred, apparently from trivial circumstances. However, it was not until 1926 that Hammar published his valuable contribution on the question of normal variations in the size of the thymus in respect to age, sex, body weight and height and also on the relationship of acute illness and chronic wasting disease. Valuable contributions from extensive analysis were made also by Greenwood and Woods. In 1927 the conclusion reached by these investigators was that "there is no evidence that so-called thymico-lymphaticus has any existence as a pathological entity."

This conclusion was reached also by a committee of the Medical Research Council and the Pathological Society of Great Britain which investigated the cause of death in persons dying suddenly from unexplained or trivial causes who at autopsy were observed to have an enlarged thymus.

Cohen concludes that the term status thymicolymphaticus as used in the coroner's court is a meaningless expression, except that it indicates that the person has expired as the result of an unexplained cause.

SAPPINGTON, San Francisco.

INFLUENCE OF THE VEGETATIVE NERVOUS SYSTEM ON THE ACTIVITY OF THE HYPOPHYSIS. I. A. DOUBOVIK, Rev. franç. d'endocrinol. **14**:151 (April) 1936.

This investigation deals with the influence of the nervous system on the activity of the anterior and the posterior lobe of the pituitary gland. The experiments were carried out on immature frogs (Rana temporaria). In one series of experiments Doubovik stimulated the anterior lobe with the induced current for about two minutes every other day for two weeks. As a result of the stimulation maturation of the roe was accelerated. Frogs of the same age used as controls showed no change. Doubovik therefore believes that the acceleration in maturation of the roe in the ovaries resulted from increased secretion in the anterior lobe. Stimulation of the stellate ganglion caused no change in twenty-five experiments. In order to determine whether he was dealing with a lack of influence on the anterior lobe or whether the secretion of the lobe was inhibited by stimulation of the sympathetic ganglion, Doubovik stimulated the medulla in the region of the vagus nerve. Again a series of twenty-five experiments revealed no change; the ovaries remained filled with immature roe. Doubovik therefore draws the conclusion that stimulation of the sympathetic and of the parasympathetic ganglions does not accelerate or inhibit the secretory activity of the anterior lobe of the pituitary gland. A similar investigation was carried out on the posterior lobe. Normal and hypophysectomized frogs were used. The expansion and contraction of the melanophores served as an indicator of activity of the posterior lobe. In normal frogs stimulation of the stellate ganglion produced contraction of the melanophores; the skin became clear in from two to five minutes, and the outlines of the epidermis were pronounced, consisting of dark spots on a clear field. Stimulation at the base of the medulla caused expansion of the melanophores; the skin became uniformly dark. In order to exclude the possibility of transmission of electrical stimulation through the surrounding tissue, Doubovik extirpated the stellate ganglion bilaterally. This procedure caused clearing of the skin for from five to six hours after the operation. These frogs survived about two weeks and showed negative phototropism. Frogs in which bilateral vagotomy was performed became light in color. These frogs displayed positive phototropism. They remained alive ten days after the operation. In order to ascertain whether the change in pigmentation of amphibians depends on the activity of the posterior lobe, Doubovik hypophysectomized a number of frogs. After this procedure the epidermis turned light. He found that irritation of the stellate ganglion of hypophysectomized frogs did not render the epidermis clearer and that irritation of the medulla of these frogs did not cause expansion of the melanophores. In instances in which only the anterior lobe was extirpated the epidermis became brownish in a day or two. When the mixed and posterior lobes of these frogs were irritated mechanically the color remained dark, while the musculature of the genital organs of the female frogs became active. Doubovik came to the conclusion that the secretory activity of the anterior lobe is independent of the nervous system. The hormonal activity of the posterior lobe is autonomous. The sympathetic system inhibits while the parasympathetic system stimulates secretion in the posterior lobe. The activity of the posterior lobe is independent of the hormonal activity of the anterior lobe.

NOTKIN, Poughkeepsie, N. Y. [ARCH. NEUROL. & PSYCHIAT.]

CHANGES IN THE CAROTENE-VITAMIN A METABOLISM IN MYXEDEMA AND IN CRETINISM. H. WENDT, München. med. Wchnschr. **82**:1679 (Oct. 18) 1935.

The administration of thyroxine to guinea-pigs and rats increases the requirement of vitamin A. Patients with hyperthyroidism have a low serum content of carotene and vitamin A. After treatment with iodine or after thyroidectomy there is an increase in the vitamin A content of the serum.

The administration of large quantities of vitamin A to patients with hyperthyroidism results in a gain in body weight and a decrease in the basal metabolism.

In myxedema there is a disturbance in the transformation of carotene into vitamin A. There was no change in the vitamin A content of the serum in a patient with myxedema who received large amounts of carotene. These results are similar to those found in experiments with animals.

The vitamin A content of the serum in eleven cretins was low, whereas the carotin content varied from a marked increase to a marked decrease in different patients. Wendt states that these findings are due to a variable disturbance in the ability of the cretin to transform carotene into vitamin A.

BRAHDY, Mount Vernon, N. Y.

## Diseases of the Muscles, Bones, Joints and Lymph Glands

OSTEO-CHONDRO-DYSTROPHY OF MORQUIO TYPE. DAVID LEVI, Proc. Roy. Soc. Med. **29**:738 (May) 1936.

Levi describes the pathologic picture presented by a girl aged 9 years. The roentgenograms showed one of the varieties of chondrodysplasia. The limbs were of the hereditary deforming chondrodysplasic type, and the deformed vertebral bodies were of the Morquio-Brailsford variety. The previous history, the family history, the ophthalmologist's report and roentgenograms of the bones accompany the report.

WILLIAMSON, New Orleans.

A DEEP INTRAMUSCULAR ABSCESS OF THE BUTTOCKS CAUSED BY ENTEROCOCCI IN AN INFANT. EMIL HURMUZACHE and EUGÉNIE ALEXA, Bull. Soc. de pédiat. de Iasi **6**:53 (April-June) 1936.

This case is reported because of the rarity of the enterococcus as the infecting organism in abscesses. The organism was obtained by aspiration from the depth of the abscess before any pointing to the surface occurred. Recovery followed wide and deep incision.

LESLIE, Evanston, Ill.

LIMITATION OF FLEXION OF THE NECK. M. NAGEOTTE-WILBOUCHEWITCH, L. LAMY and P. AIMÉ, Bull. Soc. de pédiat. de Paris **34**:250 (April) 1936.

A boy 14 years old and a girl 11 years old presented very much the same abnormality. This was a marked limitation of flexion of the neck on the chest. When an extreme effort in this direction was made, substernal pain was experienced. The other movements of the neck were free. There was kyphosis of the dorsal part of the spine which allowed the head to incline forward without flexion of the neck. Roentgenologic examination of the spine showed that the second and third cervical vertebrae were fastened together at the spinous processes as well as at the articular surfaces. This is viewed as a congenital anomaly.

BENJAMIN, Montreal, Canada.

ARSENICAL AND FERRUGINOUS WATERS IN THE TREATMENT OF LYMPHATISM. P. FARNETI, Riv. di clin. pediat. **34**:357 (April) 1936.

Farneti reviews the literature on the benefits obtained from crenotherapy in weak, debilitated children. He pleads for further clinical and experimental observations on this method of treatment.

HIGGINS, Boston.

LYMPH GLANDS IN PUBERTY. A. POPPI, Riv. di clin. pediat. **34**:429 (May) 1936.

Observations were made as to the size of the lateral lymph glands of the neck of 861 children (544 boys and 317 girls) in good health between the ages of 11 and 17 years. The following deductions were made: The lymph glands are

more developed in boys than in girls between 11 and 17 years of age. As the child grows older the glands gradually become smaller, this diminution being more rapid in girls. Usually the glands are larger in the subjects whose growth and nutrition are subnormal. The lymph glands tend to be larger in the tall than in the short youth. If there is a tendency toward anemia, the lymph glands are larger. Girls whose menstrual periods were of regular duration and amount of flow had smaller glands than those who showed some abnormality in this regard. The lymph glands were larger in the girls who showed late maturity. Previous illnesses did not seem to affect the size of the glands, excepting in the case of grip, whooping cough, diphtheria and mumps. Those with large glands usually presented a history of greater morbidity.

HIGGINS, Boston.

PSEUDOHYPERTROPHIC DYSTROPHY OF THE DUCHENNE-GRIESINGER TYPE. O. N. DE SOUZA GUIMARES, Arch. de pediat., Rio de Janeiro **7**:320 (April) 1936.

Two boys 7 and 9 years old, respectively, with Duchenne-Griesinger disease were studied. Excellent photographs are shown, illustrating the muscle weaknesses.

SANFORD, Chicago.

DIAGNOSIS AND ROENTGEN TREATMENT OF HEMANGIOMAS OF BONE. K. J. KOLJU, Röntgenpraxis **8**:226 (April) 1936.

The number of histologically verified examples of hemangioma of bone which have been reported is small. The most comprehensive papers dealing with the subject are those of the American authors Bailey and Bucy, and Bucy and Capp. The vertebral column is the part of the skeleton most commonly affected; next, the skull and the flat bones of the skeleton. Vascular tumors of the small bones of the hands and feet are extremely uncommon. The occurrence of this type of lesion is not related to age or sex.

Three cases of hemangioma of bone are reported. The first was that of an 18 year old girl whose principal complaint was of recurrent infections of the terminal phalanges of the fingers. The tips of four fingers of the right hand were thickened. Roentgenographic examination demonstrated the presence of multiple rounded areas of negative density in nearly all of the bones of the affected hand. Biopsy led to a diagnosis of capillary hemangiomatosis. In the second and third cases the bones of the pelvis were the site of the tumors; the diagnoses were not confirmed microscopically. However, they were strongly supported by auscultatory evidence. A nice refinement of auscultatory examination consisted in the use of arteriophonograms in conjunction with simultaneously recorded electrocardiograms. The first patient was treated successfully with roentgen rays.

The classification, roentgen features and treatment of hemangiomas of bone are discussed. The bibliography is useful.

MCCUNE, New York.

## Diseases of the Eye

CONGENITAL AND FAMILIAL CYSTS AND FLOCCULI OF THE IRIS. A. COWAN, Am. J. Ophth. **19**:287 (April) 1936.

Cowan reports congenital cysts and flocculi of the iris in a woman aged 32, her deceased sister (not examined) and the latter's daughter and son. The observations in three of these persons are described, and illustrations show the iris in each eye before and after mydriasis. The cysts varied in size, depending on the size of the pupils. At times they fell into the pupillary space and interfered with vision. Cowan thinks that these may not be cysts but merely pouches or sacs formed between the two layers of the pigmented epithelium of the iris.

REESE, Philadelphia. [ARCH. OPHTH.]

FAMILIAL CORNEA PLANA, COMPLICATED BY CATARACTA NIGRA AND GLAUCOMA. H. BARKAN and W. E. BORLEY, Am. J. Ophth. **19**:307 (April) 1936.

Cornea plana in a mother and two daughters is reported. In one of the daughters the condition was complicated by glaucoma, and in the mother, by cataract. All showed absence of the normal curvature of the cornea, which in profile could be seen to have the same curvature as the sclera. Two of the patients had opacity around the limbus, with blood vessels which extended about 1 mm. into the corneal tissue. A table of the corneal measurements and errors of refraction is given. The authors conclude that, clinically and practically, patients with cornea plana can be told (1) that the condition is familial; that is, if one child has it, other children will be apt to have it; (2) that, as it is probably a dominant inheritable characteristic, patients contemplating marriage should bear in mind that their children may have it; (3) that glaucoma may be a complication.

REESE, Philadelphia. [ARCH. OPHTH.]

TRANSITORY CHOKED DISK: REPORT OF A CASE WITH AN ELEVEN-YEAR FOLLOW-UP STUDY. E. KRIMSKY, Arch. Ophth. **15**:36 (Jan.) 1936.

A 9 year old boy complained of frequent vomiting, preceded by severe headache, which was relieved with the onset of the vomiting. All laboratory tests were negative. Physical examination revealed: a choked disk with 3 diopters of swelling, without disturbance of vision; slight tilting of the head toward the left; lateral nystagmus toward the right; marked tache cérébrale, and hyperactive reflexes.

Three months after the onset of his symptoms the boy reported that he was perfectly well, the vomiting, headache and choked disk having suddenly subsided. After eleven years he remains perfectly well, and his vision with small correction is normal.

WESCOTT, Chicago.

DERMOID CYST WITH CRANIAL MALFORMATION. DE JAEGER, Ann. d'ocul. **173**:31 (Jan.) 1936.

Joseph J., 14 years of age, was brought to de Jaeger in April 1935 because of a tumor in the left temporal region. He did not present any other malformation. His mother had a tumor of the identical type in the orbital cavity. He was an only child. It was stated that his tumor had always been present, but that it had enlarged since the ninth year. About fifteen days previous to this observation the child had received a blow on the tumor, and the growth seemed to disappear but reappeared and was the same size as before. Examination showed in the left temporal fossa, behind the external wall of the orbit, a neoplasm the size of a small pigeon's egg; it was soft and adherent to the bone. Palpation about the tumor gave the impression that some of the bone of that part was deficient. To assure himself that the tumor did not extend intracranially, de Jaeger referred the patient to the department of roentgenography. Details of the examination are given, with a photograph.

De Jaeger emphasizes that a chalky bony canal was found in the sphenoid bone. He thinks that this cranial malformation must be rare, as little importance is attached to the subject in the various classic works which he consulted.

MCKEE, Montreal, Canada. [ARCH. OPHTH.]

THE VITAMIN CONTENT OF AQUEOUS AND ITS ANTISCORBUTIC ACTION. C. CELLA and I. D. GEORGESCU, Compt. rend. Soc. de biol. **121**:1116, 1936.

The aqueous contains more vitamin C than any other fluid of the body. In cattle on the dry winter diet of hay and grain (which is practically free from vitamin C) the aqueous averages 20 mg. of cevitamic acid per hundred cubic centimeters as chemically determined by Bezssonoff's technic. To verify biologically the antiscorbutic action of this aqueous, guinea-pigs maintained on a diet free

from vitamin C for thirty days were given 10 cc. of it daily. According to the previous chemical determination, this dose contained 2 mg. of cevitamic acid, the amount required to protect a guinea-pig from loss of weight. Thirty days later the controls were dead whereas the animals receiving the aqueous were healthy and without scurvy.

LEBENSOHN, Chicago. [ARCH. OPHTH.]

JENSEN'S CHORIORETINITIS. G. BOSSALINO, Arch. di ottal. **43**:1 (Jan.) 1936.

The literature on choroiditis juxtapapillaris is reviewed, and four cases are reported. These occurred in young women aged from 15 to 22. In all, the characteristic fan-shaped scotoma was present, extending to the periphery and indicating a lesion involving the whole thickness of the retina, including the nerve fibers. In all, the single lesion was near the disk, the disk itself showing edema. In the first case the area of retinal edema disappeared completely in three months, leaving no visible scar, but the scotoma persisted. In the others slight pigmentary changes occurred. In two cases signs of iritis were also present, with some precipitates. All active symptoms subsided in all the patients within five months, the minimal scars indicating that the lesions were primarily retinal, with very little disturbance of the pigmented epithelium.

An interesting comparison is made between these cases and a case of choroiditis in which a very large lesion produced only a central scotoma, leaving the peripheral field normal.

In two of the patients with typical changes tuberculin tests were positive, and in the other the condition was considered as possibly due to tuberculosis, which is generally considered to be the commonest cause of the condition.

GIFFORD, Chicago. [ARCH. OPHTH.]

DETACHMENT OF THE RETINA IN YOUTHFUL PATIENTS AND THE IMPORTANCE OF SLIGHT TRAUMAS. K. VELHAGEN JR., Klin. Monatsbl. f. Augenh. **96**:26 (Jan.) 1936.

Zur Nedden's view that juvenile detachment of the retina may be hereditary is disputed by Velhagen. He refers to the observation that in juvenile detachment the tear is located in the lower portion of the eyeball, while in other types of retinal detachment the tear usually occurs in the upper portion. Furthermore, the progress of the visual disturbances in juvenile persons is slow. In these patients a large detachment, often binocular, may occur in the lower periphery with normal vision, and a decided tendency toward demarcation exists. An important observation made by Weve was that of tears in the temporal lower portion of the ora serrata in eight juvenile patients, binocular in four of them. Symptoms of tuberculous periphlebitis were absent in all of these patients except one in whom tuberculous choroiditis was suspected. Dismissing the decision as to whether or not heredity or tuberculosis may play a rôle in the genesis of juvenile detachment of the retina, he states that this type has to be strictly separated from the so-called senile or myopic type. Velhagen is of the opinion that a traumatic lesion is the more likely to cause retinal detachment the more endogenous factors are present, such as advanced age, degeneration of the retina or of the vitreous, myopia, and hereditary or congenital inferiority. Agreeing with zur Nedden in some instances, Velhagen nevertheless recommends leniency in the forensic decision as to the traumatic causation of retinal detachment. In this connection he refers to Weve's reports of retinal cysts forming after slight injuries.

STOLL, Cincinnati. [ARCH. OPHTH.]

HEREDITARY COLOR BLINDNESS: A GENEALOGY OF FIVE GENERATIONS. A. GROENOUW, Klin. Monatsbl. f. Augenh. **96**:433 (April) 1936.

In 1920 Groenouw reported a genealogy of color blindness for red and green (Graefe and Saemisch: Handbuch der gesamten Augenheilkunde, ed. 3, Leipzig, W. Engelmann, 1920). He has now succeeded in completing this genealogy over

five generations. A man and a woman of the first generation were not color blind. The disturbance originated most probably in the wife's family. A diagram of the genealogy is given in illustration. Among the thirty-two descendants there were eight color-blind men whose mothers were free from this disorder. Five women, including the one of the first generation, had color-blind sons, two had none, and the other women had no children. The color-blind men had no descendants, and two men with normal perception of color had no color-blind children. Color-blind women were absent, but eight of the nineteen men were color blind. Color blindness was absent in all the families of those who married into this family. The disturbance was transmitted according to the Horner-Bollinger type of heredity. The healthy women transmit the disorder to their sons but not to their daughters. Men free from color blindness did not transmit it to their descendants.

STOLL, Cincinnati. [ARCH. OPHTH.]

FORMATION OF SYNECHIAE BETWEEN THE MARGIN OF THE OPTIC CUP AND THE LENS IN THE EMBRYO. T. A. Vos, Klin. Monatsbl. f. Augenh. **96**:452 (April) 1936.

Two intra-ocular formations occurring in microphthalmos are described: a membrane between the ciliary body and the posterior surface of the lens, and a similar membrane connecting the retina and the lens. Eight selected cases are reported and well illustrated. Vos found that the membrane between the lens and the inner surface of the eyeball consisted of either a predominantly uveal or a predominantly retinal derivative. The mechanism is represented by an embryonal synechia between the lens and the margin of the optic cup. Isolated degeneration of the latter is considered the cause of this formation of a synechia. In this connection the eyeball is described which presented a congenital connection between the lens and a posterior portion of the retina. Vos compares this connection with a formation of folds described by several authors as ablatio falciformis of the retina. Incidental findings were colobomas, fibrous "apparent" lenses, cysts of the iris and circular detachment of the retina with the optic nerve drawn inside the eyeball. Vos considers it possible that the presence of the synechia may form an opportunity for voidance of the hyaloid artery, leading to its preservation.

STOLL, Cincinnati. [ARCH. OPHTH.]

TWO CASES OF HEREDITARY NYSTAGMUS. R. CAUSSÉ and A. MARTIN, Rev. d'oto-neuro-opht. **14**:86 (Feb.) 1936.

While much has been written about vestibular nystagmus, the literature on congenital nystagmus is meager, and its pathogenesis remains in much obscurity. Caussé and Martin discuss two points brought out by the study of two cases of congenital nystagmus in brothers: (1) the familial and hereditary character of the disease and (2) the replacement of the spontaneous nystagmus by an inverted optokinetic nystagmus. The hereditary and familial character of the disease is exemplified by the fact that it was present in three brothers and one first cousin; it existed in only one generation. Only males were affected. Research revealed that three of the antecedents had mental disturbances, two diabetes and one marked myopia. Other defects were also found, but no albinism was discovered.

Bárány first described inversion of optokinetic nystagmus, and others have demonstrated that it occurs only in association with optic or congenital nystagmus, never with spontaneous vestibular nystagmus; it is not constant. In the cases described there was difficulty in replacing the nystagmus with optokinetic nystagmus, and, even when this occurred, the inversion could not be obtained in the four fundamental directions—upward, downward, to the right and to the left—but occurred in only one or two directions, which were always the same. The direction of the inversion seemed to correspond to the direction of the spontaneous nystagmus that was most active.

DENNIS, San Diego, Calif. [ARCH. NEUROL. & PSYCHIAT.]

PRIMARY TUBERCULOSIS OF THE CONJUNCTIVA: TWO CASES. A. SAMUELSON, Nord. med. tidskr. **11**:259 (Feb. 15) 1936.

1. The patient was a boy aged 14 years. His mother had died of consumption. One month before his admission to the hospital, the preauricular and submandibular lymphatic glands on the left side became enlarged, and redness and edema of the left upper lid appeared, with purulent secretion. A pea-sized abscess (the primary focus) and several pinhead-sized yellow efflorescences were found on the conjunctiva of the upper lid and on the upper half of the bulbar conjunctiva. Exploratory excision showed tuberculosis. There were no tuberculous lesions demonstrable in other parts of the body. The disease healed in two and a half years after phototherapy. The boy was healthy when reexamined seven years later.

2. A boy aged 10 years had purulent excretion from the left conjunctiva and enlargement of the preauricular and submandibular lymphatic glands on the same side. At examination one week later there were edema of the lower lid on the left side, mucopurulent excretion, longitudinal ulceration and several pinhead-sized yellow tubercles on the palpebral conjunctiva. The preauricular gland was walnut-sized and was suppurating; in the pus tubercle bacilli were found. With Finsen treatment of the tuberculous process of the conjunctiva the latter healed in six months, at which time there was still a fistula from the suppurating gland. After another six months this process, too, was found to have healed. No tuberculous lesions were demonstrable in the internal organs.

WALLGREN, Göteborg, Sweden.

## Skin Diseases; Allergy

PREVENTION OF DERMATITIS VENENATA DUE TO POISON IVY IN CHILDREN. M. MOLITCH and S. POLIAKOFF, Arch. Dermat. & Syph. **33**:725 (April) 1936.

Molitch and Poliakoff met with great success in the prevention of dermatitis venenata from contact with poison ivy by injections of an alcoholic extract of poison ivy (1:50). They used the patch test to determine whether persons were sensitive. The injections were given, as recommended by Spain and Cooke, at weekly intervals. The doses given were as follows: first, 1 cc. of a 1:10,000 dilution of the extract; second, 1 cc. of a 1:5,000 dilution; third, 1 cc. of a 1:2,000 dilution, and, fourth, 1 cc. of a 1:1,000 dilution. Then 1 cc. of a 1:500 dilution was given at weekly intervals throughout the entire season. The authors believe that any one giving a history of ivy poisoning should have the benefit of this method of prophylaxis during the summer months.

DULIN, Iowa City.

WHY NEGLECT THE SCALP? J. BUTLER, Arch. Dermat. & Syph. **33**:729 (April) 1936.

The importance of treating the scalp in acne rosacea or seborrheic dermatitis of the glabrous skin is greatly underestimated. Butler has found that seborrheic dermatitis of the postauricular region and face cleared more rapidly and had less tendency to recur if the scalp was treated simultaneously. He prefers a tincture of green soap made from chemically pure sodium hydroxide and pure Malaga olive oil for the shampoo and believes this should be "thorough, vigorous and occupy at least ten minutes." Ointments should not be applied to the scalp. A lotion may be applied with a medicine dropper, if indicated. If the scalp is dry, massage may be helpful, and if the scalp is oily, massage is contraindicated.

DULIN, Iowa City.

ALLERGY IN RELATION TO INTELLIGENCE AND SCHOOL SUCCESS IN CHILDREN. ELLEN B. SULLIVAN and GERTRUDE MACQUEEN, J. Juvenile Research **19**:173 (Oct.) 1935.

Sensitivity has no relation to intelligence in children. HAMILL, Chicago.

SEVERE REACTION FOLLOWING A SKIN TEST. R. EVANS, Brit. M. J. **1**:795 (April 18) 1936.

Evans reports a severe reaction to a skin test made with a weak solution of "dust-borne protein." This test was followed by a severe attack of asthma and generalized urticarial eruption. A subcutaneous injection of epinephrine relieved the condition. ROYSTER, University, Va.

TREATMENT OF VOLUMINOUS ANGIOMA OF THE UPPER LIP BY INTRATUMORAL INJECTIONS OF QUININE SALTS, FOLLOWED BY EXCISION. E. SORREL, Bull. Soc. de pédiat. de Paris **34**:210 (April) 1936.

In a boy 8½ years old a large cavernous angioma involved the left half of the upper lip and the cheek, up to the left lower eyelid, and encroached on the left nostril. At three day intervals 0.25 Gm. of quinine hydrochloride and 0.25 Gm. of antipyrine in 1 cc. of water were injected into the mass until fifteen injections had been given, the mass gradually becoming fibrosed. Then, through an incision on the inner surface of the lip, the growth was excised. The wound healed nicely, and there was no visible external scar. This method of treatment is said to give the best results in the removal of a growth of this type.

BENJAMIN, Montreal, Canada.

TREATMENT OF KELOIDS IN INFANCY. A. L. SUQUE, Paidoterapia **14**:1159 (April) 1936.

Suque refers briefly to the clinical characteristics of the cicatricial and keloid formations in children and to their greater frequency in children than in adults. The treatment of keloids depends on their extension, location, size and structure. If small, fibrous and relatively thick, they may be treated by bipolar diathermic coagulation, application of carbon dioxide snow or implantation of radium. Roentgen radiation is preferred in treating large keloids. Failures are due to the use of a defective technic. Suque prefers the use of radium if it is not a question of large extensions of hypertrophic tissue and states that radium is easily used in infants. HERRON, Spokane, Wash.

## Surgery and Orthopedics

PEDIATRIC SURGERY IN GENERAL PRACTICE. JOHN FRASER, Edinburgh M. J. **43**:349 (June) 1936.

John Fraser in a series of "clinical recollections and reflections" devotes this contribution to a hypothetic situation in which he accompanies a busy general practitioner on his daily rounds. The first visit is to a boy of 7 years, who is found to have an enlarged cervical lymph gland. Discussing its many possibilities with each other and with the parents the physicians are reminded that in Scotland, where so much tuberculosis exists among the dairy cattle, this chronically enlarged gland, now broken down and one of a chain, is likely to be tuberculous. They decide that as the lesion is local the surgical removal of the glands with the tonsils will eradicate the tuberculous element.

Other common and disturbing ailments are found among children visited, such as appendicitis with atypical symptoms, which has been neglected until peritonitis has begun. Another illustration is found in a boy 5 years of age who had been

limping and complaining of pain in his hip, a condition whch might be one of several conditions, such as early tuberculosis, an effusion into the joint, a hemorrhage in the region of the epiphysial cartilage, a streptococcic infection of the joint, or Perthes' disease. A roentgenogram which had been taken did not give any help. A conservative course would seem advisable, during which if there is simply a sprain the symptoms will vanish within a few days or weeks. If the disturbance is something more serious, the child, who is being kept in bed during this period, will not be worse off and may be allowed to move his extremities if he wishes.

Other questions of surgical diagnosis arose, such as that concerning a child who had an insidious development of pus in the pleural cavity; enuresis in another child proved to be simply a neurosis and not organic and incurable as would be the case if the condition were due to bladder function of the spinal cord type.

Both the general practitioner and the surgeon enjoyed the experience together, and they agreed that the interchange of ideas and impressions was mutually helpful.

NEFF, Kansas City, Mo.

MINOR SURGERY OF CHILDHOOD. T. TWISTINGTON HIGGINS, Practitioner **136**:454 (April) 1936.

The problems of minor surgery in childhood as dealt with mainly in the outpatient department are presented. The author stresses the importance of the psychologic aspect in working with children. Gentleness and truthfulness are highly essential. The proper type of anesthetic and its proper administration are likewise of distinct aid to successful surgical treatment in childhood.

A considerable number of minor surgical conditions found in the new-born are given careful consideration. These include cephalematoma, facial paralysis resulting from pressure of the forceps, fracture of the long bones, tongue-tie, talipes, torticollis, umbilical hernia, nevi, inguinal hernia, a condition necessitating circumcision and a number of other minor conditions.

The surgical treatment of disorders of the upper air passages in childhood is discussed. The author feels that indiscriminate tonsillectomy and indifferent operative technic are two evils that are still prevalent to a certain extent. Indications for removal of adenoids or tonsils are carefully considered, as well as the operative technic.

SAPPINGTON, San Francisco.

SURGERY AND ORTHOPEDICS OF CHILDHOOD, 1936. ALBERT MOUCHET and C. RŒDERER, Paris méd. **1**:569 (June 20) 1936.

Mouchet and Rœderer review the literature on surgical and orthopedic conditions in children in 1936. The review covers various types of deformity and abnormality of the muscles and tendons, diseases of the spine and joints, fractures of the long bones and various types of synostosis and exostosis. Among the interesting cases reported are one of sarcoma of the thorax involving the pleura and the lung and another in which osteomalacia was apparently cured by unilateral parathyroidectomy.

LESLIE, Evanston, Ill.

SPONDYLOLISTHESIS WITH SPINA BIFIDA. V. CHARRY, Rev. d'orthop. **23**:345 (May) 1936.

When the question of spondylolisthesis was presented before the Congress of Orthopedics, the author described this case of spina bifida of the fifth lumbar vertebra associated with spondylolisthesis. A plaster corset was applied and worn for four months without relief. The author therefore fused the lumbar portion of the spine from the fourth lumbar vertebra to the sacrum. After this there was complete relief from symptoms. In the author's opinion spina bifida was the factor favoring spondylolisthesis.

RYAN, Vancouver, Canada.

## Miscellaneous

ORAL ABSORBABLE BISMUTH. P. J. HANZLIK, A. J. LEHMAN and A. P. RICHARDSON, J. Pharmacol. & Exper. Therap. **57**:126 (June) 1936.

A preliminary report indicates that soluble sodium bismuthate administered orally bids fair to be a simple and effective agent for treating syphilis in man. It is also effective when given by intramuscular injection. A more detailed report will probably follow.

PILCHER, Cleveland.

OXYGEN ADMINISTRATION (REPORT OF THE COMMITTEE ON PUBLIC HEALTH RELATIONS OF THE NEW YORK ACADEMY OF MEDICINE). New York State J. Med. **36**:828 (May 15) 1936.

This comprehensive report gives information regarding oxygen tents, their use for adults and children, fire hazards and general advice regarding sterilization and other features. The study was made necessary by the fact that many tents are not only inadequate but even dangerous and much oxygen is wasted. The committee urge that physicians prescribe definitely the concentration of oxygen desired. The oxygen content should be tested two or three times daily and recorded. Cooling devices should be provided, and the relative humidity should be maintained between 40 and 60 per cent. Tents without blowers are usually unsatisfactory. Methods for sterilization of tents are given. All tents should have conspicuous fire warnings, and no cellulose nitrate, celluloid or other highly inflammable materials should be employed. The use of nasal catheters or tubes to prevent drying of mucous membranes is approved if the oxygen is passed through at least 3 inches (8 cm.) of water. Up to 12 liters per minute may be used. The same principles apply to tents for children as to those for adults, except that a higher temperature and sometimes a higher humidity may be required. The authors approve of a tent with an aperture at the top, provided it is not placed near an open window or near a draft that will draw oxygen from the tent.

AIKMAN, Rochester, N. Y.

A NOTE ON THE TREATMENT OF PLUMBISM. F. F. PINCUS, M. J. Australia **1**:463 (April 4) 1936.

Sodium thiosulfate is regarded by Pincus as a specific for acute and chronic plumbism and is the only treatment used, besides general hygienic measures and symptomatic treatment. The average dose for adults is 12 cc. of a 15 per cent solution given intravenously every other day until all symptoms of active poisoning have disappeared. The stubborn constipation so common in plumbism is overcome by sodium thiosulfate given orally in a mixture, up to 2 Gm. (30 grains) three times a day. The oral use of the salt does not appear to necessitate reduction of the intravenous dose or to increase the effectiveness of the latter.

GONCE, Madison, Wis.

THE CONCENTRATION OF LEAD IN THE URINE OF WORKERS AT MOUNT ISA MINES, LIMITED, QUEENSLAND, WITH SPECIAL REFERENCE TO ITS VALUE IN THE DIAGNOSIS OF LEAD POISONING. D. O. SHIELS, M. J. Australia **1**:559 (April 25) 1936.

In a study of twenty-nine subjects with compensatable lead poisoning and eighty-five who were fit and were exposed to generally similar hazards, Shiels found that symptoms of lead poisoning may be expected when the urinary excretion of lead reaches 0.21 mg. per liter.

GONCE, Madison, Wis.

LEAD POISONING IN JAPANESE CHILDREN. K. YASUNAGA, Nourrisson **24**:1 (Jan.) 1936.

The lead contained in toilet powders has been a frequent source of lead poisoning among breast-fed Japanese babies. The signs and symptoms of lead

poisoning are detailed, especial emphasis being placed on the symptoms of nervous disorder and the changes observed in the spinal fluid. The diagnostic value of deposits of lead in the ends of the long bones is stressed. The treatment should be both prophylactic and curative. Under the latter large doses of calcium are advised.

McCLELLAND, Cleveland.

THE PROBLEM OF DYSLIPOIDOSIS IN PEDIATRICS. MATÍAS URIBES, DOMINGO ESPINÓS and ENRIQUE VILAPLANA, Pediatría españ. **24**:461 (Dec.) 1935.

Uribes, Espinós and Vilaplana enter into a discussion and a detailed description of the various clinical pictures in which dyslipoidosis obtains and suggest a scheme of classification into (1) primary systematized lipoidosis and (2) secondary nonsystematized lipoidosis. The former is again subdivided into phosphate lipoidosis, generalized cerebrosidal lipoidosis and cholesteric lipoidosis. These in turn have several subdivisions.

Under secondary nonsystematized lipoidosis they enumerate the pulmonary steatosis of Debré, the subcutaneous lipogranulomatosis of the newly born, progressive muscular lipogranulomatosis, the hyperplasia of Goldschmidt-Isaac, diabetic lipemia with lipoidocellular hyperplasia and other less known forms.

SCHLUTZ, Chicago.

ACUTE CORROSIVE POISONING IN CHILDHOOD. S. FRITZ, München. med. Wchnschr. **83**:174 (Jan. 31) 1936.

Children with acute lye poisoning should be sent to a hospital after they receive first aid treatment. With proper treatment stricture of the esophagus can be prevented in from 70 to 90 per cent of the cases. In the cases with marked stricture gastrostomy should be performed earlier than it has been in the past. The passage of sounds should be started as early as the fifth or the sixth day. If one waits too long (two weeks), strictures will develop, and then the early treatment cannot be carried out. When strictures have developed, treatment with sounds must be delayed for from six to eight weeks.

BRAHDY, Mount Vernon, N. Y.

PRESENT STATUS OF THE KNOWLEDGE OF MOSQUITOES OF CHINA AND THEIR RELATION TO HUMAN DISEASES. L. C. FENG, Chinese M. J. **49**:1183 (Nov.) 1935.

This report comes from the division of parasitology of Peiping Union Medical College.

The mosquito faunas of the great territories and varied climates of China are discussed. The seasonal incidence of malaria in different regions corresponds closely to the seasonal distribution of Anopheles in the locality. In the southern portions, as far as Hongkong and Hainan Island, malaria becomes a serious problem if it is carried by troops or laborers, many epidemics having occurred in the few years before the time of writing.

Filariasis is found south of 35 degrees north latitude. Probably Anopheles hyrcanus sinensis is the most common species of mosquito in the rural areas where filariasis is more common. Dengue is endemic in South China, but it has never been reported north of Shanghai. The two mosquito carriers are Aedes (S.) albopictus and Aedes (S.) aegypti.

NEFF, Kansas City, Mo.

THE INCIDENCE OF VARIOUS DISEASES AMONG CHILDREN IN MOUKDEN. Y. E. KAO, Chinese M. J. **50**:466 (April) 1936.

Kao is interested in the incidence of diseases in infants and children in his city, as well as in the influence of treatment thereon. To the pediatric department of the local medical college and hospital, in a period of three years, nearly 7,000

children were brought for treatment. He lists the many conditions for which children were brought. The diseases due to animal parasites occupy a prominent place from the point of view of frequency, second only to acute bronchitis, diarrhea, whooping cough and measles. The first year of life and the months of June and July show the greatest incidence of disease.

NEFF, Kansas City, Mo.

METEOROLOGICAL FACTORS IN THE PATHOGENESIS OF DISEASE. A. WALLGREN, Nord. med. tidskr. **11**:625 (April 18) 1936.

Wallgren gives a summary of present knowledge of meteorologic influences on diseases, especially from a pediatrician's point of view. Pseudocroup, tetany, common cold, acute pneumonia, asthmatic and epileptic attacks are considered in their eventual connection with the passages of cyclones. The still unknown meteorological factor that is active (probably a fraction of the electricity in the air) influences the vegetative nervous system, causing a hypersensibility. In persons who are disposed to the aforementioned diseases this hypersensibility can provoke manifestations of these diseases. Wallgren gives some details of the occurrence of pseudocroup in Göteborg; the cases multiply at the time that the front of a cyclone is passing.

WALLGREN, Göteborg, Sweden.

# Society Transactions

## CHICAGO PEDIATRIC SOCIETY

*Regular Meeting, March 16, 1937*

ROBERT A. BLACK, M.D., *President*

JAMES H. WALLACE, M.D., *Secretary*

BIRTH WEIGHT: ITS STATISTICAL CORRELATION WITH VARIOUS FACTORS. DR. M. A. PERLSTEIN and DR. A. LEVINSON.

A statistical study of 3,149 records of children born at the Cook County Hospital and the Mount Sinai Hospital in 1928 was made. It was found that birth weight depended on various factors. The results of this study may be summarized as follows:

1. The average birth weight regardless of race or sex was 7.13 pounds (3,234 Gm.).

2. Male children weighed on the average 0.2 pound (90.7 Gm.) more than female children.

3. White children weighed on the average 0.25 pound (113.4 Gm.) more than Negro children.

4. The economic and social status of the parents had no effect on the birth weight of the child.

5. Children born during the warm months of the year have a tendency to be slightly heavier than children born during the cold months.

6. Legitimate males weigh the same as illegitimate, but legitimate females weight more than illegitimate.

7. The mothers in the lower social and economic status have a tendency to marry earlier and bear more children in rapid succession than the mothers in better economic classes.

8. Birth weight increases with the parity of the mother up to the seventh parity, after which it decreases.

9. Birth weight increases with maternal age, older mothers giving birth to heavier children than younger mothers.

On the basis of the partial coefficients of correlation, prediction formulas were calculated for birth weight according to maternal age, parity, sex and race as follows:

$$\text{Negro birth weight} = 0.07P + 0.04A + \begin{cases} 6.08 \text{ Male} \\ 5.78 \text{ Female.} \end{cases}$$

$$\text{Cook County Hospital birth weight} = 0.06P + 0.04A + \begin{cases} 6.22 \text{ Male} \\ 6.02 \text{ Female.} \end{cases}$$

$$\text{Mount Sinai Hospital birth weight} = 0.12P + 0.03A + \begin{cases} 6.35 \text{ Male} \\ 6.13 \text{ Female.} \end{cases}$$

From the foregoing formulas it is evident that both parity (P) and maternal age (A) affect the birth weight of the child, parity being the more important factor. Parity exerts its greatest influence on children born to mothers during the middle of their child-bearing age (from 25 to 34 years), being less important in the very young and very old mothers. Parity is a more important factor in the higher social plane. In using such prediction formulas to estimate the birth weight of an expected child, one should take into consideration the fact that factors other than those included in the formulas may play a rôle in affecting the actual birth weight.

DISCUSSION

DR. A. LEVINSON: These statistics show once more that one cannot isolate the new-born baby from its surrounding world. Even birth weight, which is only one of the factors in the life of the new-born infant, is influenced not only by the health of the mother but by her age and parity and even by the season of the year.

This holds true not only at birth but throughout the child's life, a fact which must always be kept in mind.

DR. JULIUS H. HESS: I wish to correct one impression that may have been left unintentionally by Dr. Perlstein's paper. I am firmly of the belief that birth weights can be influenced by diet. In my early years at the Michael Reese Hospital, two of our obstetricians placed mothers on diets very low in carbohydrates, and the babies they had were not only thin but emaciated. During the recent economic stress the fact that the birth weight was not lower was due, I think, to the fact that many of the mothers on relief purchased relatively large amounts of foods containing much carbohydrate because of the lower cost of such foods as compared with foods containing protein.

DR. M. A. PERLSTEIN: The relationship between the economic status of the mother and the birth weight of her child has been studied by others also, notably by Russel, who investigated the effect of economic conditions on birth weights in Europe in the prewar and postwar periods. No relationship between birth weight and nutrition was found. It may be possible, as Dr. Hess states, that mothers fed a diet poor in carbohydrate will have small babies, for it is well known that diabetic mothers with hyperglycemia will have large babies. However, as Dr. Hess pointed out, poor economic conditions do not result in diets low in carbohydrates. Perhaps this is one of the reasons that economic conditions do not affect birth weights.

CARE OF THE SKIN OF NEW-BORN INFANTS: A FIVE YEAR STUDY OF 3,500 NEW-BORN INFANTS. DR. H. N. SANFORD.

A survey of the literature reveals conflicting opinions as to the frequency of acquired lesions of the skin in the new-born. This seems to exist because there is a difference in stating just what is meant by lesions of the skin. All of the important skin lesions in the new-born may be placed in three groups: First, irritations. This includes all erythematous macules and papules, such as erythema toxicum and all forms of intertrigo. Second, pustules. This includes all vesicles and pustules, such as benign pustulosis and forms of impetigo and pamphigus neonatorum that do not exfoliate. Third, pustules with exfoliation. This includes all pustules and vesicles that exfoliate, such as the form of empetigo that exfoliates, pemphigus and dermatitis exfoliativa.

In a five year period, from 1930 to 1936, 3,500 new-born infants were given daily examinations for lesions of the skin, and the types of lesions observed were noted. There were no lesions of the third class in the series. For a period of a year 2 per cent ammoniated mercury ointment was used on the skin at birth and water thereafter. The following year ammoniated mercury ointment and olive oil were used. The next year olive oil was used alone, the next year a commercial baby oil and the next year mineral oil and olive oil, and the last year the skin was untouched during the first nine days of life.

The following conclusions were drawn:

1. Nursing technic is the greatest factor in the care of the skin of the new-born infant. This includes aseptic control and isolation of infants with irritated skins.

2. Granted that the technic outlined is followed, about 10 per cent of all new-born infants will show some cutaneous irritations.

3. Pustules may be practically eliminated by the nursing technic outlined and the following routine treatment: wiping off the excess blood on the new-born child's skin at birth and not touching the skin further during the first nine days of life. After this olive oil or mineral oil may be used for the daily bath.

PROTAMINE INSULIN: ITS USE IN CHILDREN. DR. ALVAH L. NEWCOMB, DR. MARK W. DICK and DR. LOUISE SCHNUTE.

Since March 1936, we have used protamine insulin in the treatment of 32 patients with juvenile diabetes mellitus in the hospital and outpatient department. Of the 32 children, 14 have had from two to six weeks' study in the Children's Memorial Hospital. In the hospital patients the diets were essentially unaltered with the change to protamine insulin, although in a few instances redistribution of the carbohydrate between the three meals was found advantageous. Meals were served at 8:00 a. m., 12:00 noon and 6:00 p. m.; determinations of blood sugar were made at 6:30 a. m., 11:00 a. m., and 2:00, 5:00 and 11:00 p. m., on capillary blood by a modified Folin-Wu method. Over 2,000 determinations of blood sugar were made in this study. Estimations of urinary sugar were made on six hour specimens by Benedict's method. Observations of the effects of varied schedules and types of protamine insulin were carried out.

From this study of 14 hospital patients and 18 outpatients, the following conclusions have been drawn:

1. Patients with mild juvenile diabetes can be treated with a single morning dose of protamine insulin and good control of the diabetes secured.

2. Simultaneous matutinal administration of a large dose of protamine insulin and a small dose of regular insulin will control the condition in a majority of the patients with severe diabetes.

3. An adequate evening or midnight dose of protamine insulin will produce a normal amount of blood sugar during the period of fasting.

4. Protamine calcium insulin failed to produce adequate control of glycosuria and hyperglycemia.

5. Protamine zinc insulin produced a normal amount of blood sugar at midnight and during fasting in a shorter period of time than plain protamine insulin.

6. In general, the mothers reported that the children did not experience the periods of intense hunger, that they were more active and alert and that those who received all the insulin in the morning were happier and more stable emotionally. Of these 32 patients, 21 are now receiving only one matutinal dose of protamine insulin.

DISCUSSION

DR. GERARD N. KROST: I have had an opportunity of seeing 3 of these patients of Dr. Newcomb's at the Wesley Memorial Hospital, and there are one or two points I think might be emphasized.

On the protamine zinc insulin the reactions were much less marked when the children had hypoglycemia. A 7 year old child on 25 units of regular insulin, 15 in the morning and 10 before the evening meal, with equal distribution of carbohydrate, was under poor control. He was put on protamine zinc insulin, 20 units, and on the third day I went into the ward at 11 a. m. and found that he was very drowsy but responding to questions well. He was given some orange juice and soon afterward the noonday meal. He showed no severe symptoms. The blood sugar was 25 mg. per hundred cubic centimeters at this time. This child is now on 12 units of protamine zinc insulin, and his blood sugar is from 40 to 60 mg. per hundred cubic centimeters every morning without symptoms, and the blood sugar is practically normal throughout the rest of the day.

Another thing that could be emphasized is that there does seem to be some variability in the rate of absorption: While one child will get along if all the insulin is given in the morning, there are exceptions.

One of Dr. Newcomb's patients is now at the Wesley Memorial Hospital. When he came he had 52 units of insulin in three doses, 20, 16 and 16 units, with equal division of carbohydrate. He was put on protamine zinc insulin, 35 units, and regular insulin, 15 units, at the same time in the morning, but this did not control the evening hyperglycemia. The meals were divided into one-fifth, two-fifths and two-fifths, but this still did not control the condition. It was then decided to start giving him some of his milk at night, but he still had sugar in

the urine in the evening and the blood sugar was high at 5:00 and at 10:00 p. m. Probably he will have to be given 40 units of protamine zinc insulin in the morning and 10 units of regular insulin at noon to control the condition.

A 12 year old girl was in the medical service, not the pediatric service; she received regular insulin before each meal, the doses totaling from 65 to 70 units, and the meals were four in number, but her condition was still under poor control. When her diabetes was under control she was discharged, but she returned with a severe hypoglycemic reaction. She was kept on regular insulin for some time and was then put on protamine zinc insulin, 35 units. Her diabetes is now under good control, and she has gained weight and is feeling well.

DR. ALVAH L. NEWCOMB: I can only confirm what Dr. Krost has said about the very low blood sugar. The percentage of blood sugar becomes quite alarming on many occasions, and one has to give a large amount of dextrose. One child was sent home with about 30 units of protamine insulin. He started having a reaction about 6:00 a. m. and at 12:00 was given insulin. He went into insulin shock, becoming absolutely limp, and it was impossible to wake him, but when Karo syrup was administered with a medicine dropper by mouth he responded in about ten minutes.

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*Regular Meeting, April 20, 1937*

ROBERT A. BLACK, M.D., *President*

JAMES H. WALLACE, M.D., *Secretary*

TREATMENT OF CRYPTORCHIDISM WITH GONADOTROPIC HORMONES. DR. L. M. HARDY (by invitation), DR. JOHN A. BIGLER, Highland Park, Ill., and (by invitation) DR. H. V. SCOTT.

This study was made on a group of 96 boys ranging in age from 1 to 13 years. There were 89 patients with 113 undescended testicles, 5 with postoperative atrophy of the testicle and 2 with hypoplasia of the genitalia but without cryptorchidism.

We were able to compare the effects of two different gonadotropic extracts on cryptorchidism and the genitalia: (1) the gonadotropic principle from the urine of pregnant women, which assayed 100 rat units per cubic centimeter, and (2) the gonadotropic principle of the anterior lobe of the pituitary gland, which assayed from 10 to 15 rat units per cubic centimeter. Injections were given either intramuscularly or subcutaneously. A dose of from 1 to 3 cc. was maintained in 42 cases, from 3 to 4 cc. in 19, from 4 to 5 cc. in 5 and from 5 to 7 cc. in 5. Rest periods were given to 32 patients. Local or general reactions varying from local erythema to generalized allergic manifestations occurred in 32 boys. Some changes in behavior were occasionally noticed.

In 14 boys one or more of the changes which occur at puberty developed; 6 boys (aged from 12 to 13 years) began to show pubic hair and voice changes, 4 (aged from 3 to 12 years) pubic hair and enlargement of the penis and 4 (aged from 4 to 11 years) only pubic hair. In 5 patients hernias developed during treatment. There were never any changes in the urine, and the height and weight were not unduly influenced.

There was enlargement of normal-sized testicles in 17 patients, 9 of whom received the gonadotropic substance from the urine of pregnant women, 3 the extract of anterior lobe and 5 both extracts. Of 7 patients with small testicles, 3 showed an increase to normal size. In 6 testicles with postoperative atrophy no change occurred. Enlargement of a previously small-sized penis occurred in 5 of 15 boys, all 6 years of age or younger. In 8 boys, all 6 years of age or younger, there was an increase in size of a previously normal-sized penis. The penis has returned to normal size in all but 6 patients.

The gonadotropic principle of the anterior lobe of the pituitary gland was used in the treatment of 32 boys with 40 undescended testicles. In 26 cases the testicle remained unchanged in location, in 4 there was partial descent, and in 10, or 25 per cent, there was complete descent. On further observation after treatment was discontinued, in only 7, or 18 per cent, did the testicle remain descended. If those testicles which partially descended are included, 14, or 35 per cent, were benefited.

The gonadotropic substance from the urine of pregnant women was used in the treatment of 23 patients with 31 undescended testicles. No change was observed in 12 testicles; 4 partially descended and 15, or 48 per cent, completely descended. On further observation only 14, or 45 per cent, remained descended. If the testicles which were partially descended are included, 19, or 61 per cent, were benefited.

Both extracts were used in the treatment of 16 boys with 20 undescended testicles. In 9 of these testicles there was no change; 2 partially descended, and 9, or 45 per cent, showed complete descent. On further observation only 5 testicles, or 25 per cent, remained descended. If one includes the partially descended testicles, 11, or 55 per cent, were benefited. By dividing the subjects into age groups it is found that descent occurred in 18 per cent of those from 1 to 4 years old, 36 per cent of those from 4 to 9 years and 43 per cent of those from 9 to 13 years old.

DISCUSSION

DR. RALPH H. KUNSTADTER: I wish to thank Dr. Hardy and his co-workers for their excellent piece of work. During the past five years my co-workers and I have treated over 50 unselected boys with cryptorchidism. Our percentage of successfully treated patients is a little higher, but in our group of 39 patients studied in detail, 29 were between 8 and 14 years of age. Of these, only 36 per cent were of normal constitution as contrasted with 64 per cent that showed dysfunction of endocrine glands. Another factor which we believe is significant is that in 29 (74.4 per cent) the condition was bilateral, and in only 10 (25.6 per cent), unilateral. Our results show a definite correlation between dysfunction of endocrine glands and bilateral cryptorchidism, with the most satisfactory results occurring in the latter group. Unilateral cryptorchidism occurred more often in boys of normal constitution, and the results of the treatment in this group were less satisfactory. I am using the term "dysfunction of endocrine glands" to include hypopituitarism and other polyglandular disorders.

Cramer (*Endocrinology* **21**:230 [March] 1937) reviewed all cases reported in the literature and found complete descent in 71.6 per cent, partial descent in 16 per cent and failure in 12.4 per cent of those in which a gonadotropic hormone was used in treatment—figures corresponding to ours (71.8, 10 and 18.2 per cent). His review was not complete, and possibly with the inclusion of more recent reports the figures might have been lower. Of our entire group of 39 patients, only 7 have been operated on (2 are to be operated on). Two cases of unilateral cryptorchidism were encountered in which exploration failed to reveal the testes. Two boys with bilateral cryptorchidism presented clinical evidence of primary pituitary insufficiency, and at operation the testes were found to be atrophied. Three patients revealed varying degrees of mechanical obstruction. One of these had the condition further complicated by a hernia.

Sexton states that when the testis is not definable in any part of the genital tract true cryptorchidism does not necessarily exist. One of our patients began to have severe headache, and treatment had to be discontinued; otherwise the reactions were mild. Several of the patients have been followed for over five years, and no unfavorable symptoms or signs have developed. No permanent hypertrophy or atrophy of normal testes developed, and no symptoms of prostatic hypertrophy resulted. There was no premature sexual development in those who were treated before puberty.

Dr. Hardy mentioned that in some of his patients the penis and testis showed enlargement. However, in none of our patients did a normal penis or testis hyper-

trophy as a result of treatment. One interesting case was that of a boy brought into the Sarah Morris Hospital recently with torsion and gangrene of the testis following about fourteen injections of hormone.

We have found that by determining the amount of gonadotropic principle in the urine of cryptorchids some conclusion can be reached as to the functional state of the hypophysis and testes. The work was reported recently in detail (Hess, J. H.; Kunstadter, R. H., and Saphir, W.: Urinary Excretion of Gonadotropic Hormone in Cryptorchidism, *J. A. M. A.* **108**:352-354 [Jan. 30] 1937).

Most of our patients were treated with the gonadotropic hormone from the urine of pregnant women; recently we have treated 10 or 15 patients with anterior pituitary N.F. but do not believe that the latter has any advantage for the treatment of cryptorchidism per se.

We also agree with Dr. Hardy that as far as the amount of treatment is concerned the best results usually occur with the smaller total doses. With a short course of treatment the response was usually rapid, and when prolonged treatment was necessary the response was usually not as satisfactory.

Recently we finished a study in which we examined the blood serum of a group of boys who had been treated with the gonadotropic hormone from the urine of pregnant women, for the presence of antihormones and antibodies, and we were unable to detect true antihormones or antibodies. If there is any objection to prolonged treatment, it is probably because of a refractoriness of tissue, as Engle has demonstrated. At present a group of our boys are being studied before and after treatment by the psychiatric group at the Mandel Clinic from the standpoint of changes in personality and behavior. We have reason to believe that some of these children who showed definite evidence of dysfunction of endocrine glands show a satisfactory improvement of their behavior difficulties after treatment.

DR. GEORGE F. MUNNS: I wish to ask Dr. Hardy about the age at which he recommends this treatment. It seems to me that perhaps 7 years and before is a little early. I see boys quite frequently who go along with an undescended testicle until 12 years of age, and then it descends normally. I wonder if there is any hurry about treating them before they are at least 10 years of age. Probably in a good many instances the testicle may descend between 10 and 15 years of age, and unless one is treating the family anxiety I think it is unnecessary to treat the patient as early as 7 years of age. It is difficult to tell what the results are in percentages, for if the testicle is not present in the sac at 5 years it may be there normally later.

DR. MAXWELL P. BOROVSKY: I should like to ask what explanation the essayists have for failure to get results in infants and young boys. It seems that the results might be better in young infants and early childhood with a given dose of glandular extract. I have tried this treatment in infants of 6 to 7 months of age, and the results have been universally bad. I should like to know why the gonadotropic hormone from the urine of pregnant women would not do the same work in the child of that age as in the child perhaps several times as large in body.

DR. JOHN A. BIGLER: In reviewing the various reports of cases of cryptorchidism treated with the gonadotropic hormone mentioned it is found that complete descent occurred in 62.5 per cent. The highest percentages of good results are reported in the smaller groups of cases. I think that great consideration must be given to the type of case in which the treatment is used.

So far as determining whether obstruction is present, I do not know how that can be done. In any patient whom we treated, the testicle could not be pushed out of the canal, or if it could be pushed out with considerable force it immediately snapped back. We operated on 22 of the children who were unsuccessfully treated with the gonadotropic hormones mentioned, and in 8 of these there were definite adhesions. In the others no adhesions were present, and why the testicles did not come down and stay down I do not know.

As to Dr. Munns' question, there is great difference of opinion as to why the testicle does not descend. Most surgeons operate at the ninth year, for they feel that atrophy of the testis occurs if it is allowed to remain in the abdomen. There have been many reports of malignant change in the testis, and this occurs in a larger percentage of undescended than of descended testis. Many reports give the percentage of young adults with cryptorchidism as 2.2 per thousand, so cryptorchidism does occur during adult life. Our reason for recommending treatment after the seventh year is that in the cases in which hypertrophy of the penis occurred it always occurred before the age of 6 years. During the entire study there was no evidence that the individual dosage had any effect, but we did determine that improvement, if it was to occur, should be evident before 4,000 rat units was given. Age seems to play no part in this. The standardizations of the two substances which we used are entirely different. One is based on increase in weight of the ovary, and the other, on formation of corpora lutea. The bases for determining the rat units are entirely different. The reactions that occurred were local. One of the boys experienced marked dyspnea, urticaria and a rash which was rather alarming, but this did not develop after changing to the extract of pituitary gland. I think there is no question that children with endocrine disturbance will respond better to treatment.

What we tried to determine was whether this extract had any effect on the genitalia of children without endocrine disturbances. I think one thing must be determined and that is what happens to those boys with early stimulation of the genitalia before puberty—whether this treatment brings about any later changes. Six of our boys still show considerable hypertrophy of the penis. We have observed them for a year since finishing treatment, but what the final outcome will be we do not know.

Dr. H. V. Scott: The most pleasant part of this work to me was hearing Dr. Hardy's presentation this evening.

Acute Appendicitis in Children. Dr. W. J. Potts, Oak Park, Ill. (by invitation).

This study of acute appendicitis was made to determine in general the mortality in acute appendicitis in children and in particular the effect on the mortality of recent changes in the treatment of peritonitis and the influence of the recently more conservative attitude toward the management of appendical abscess. The 592 patients with appendical disease admitted to the Children's Memoral Hospital during the years from 1921 to 1935 were divided into five year groups and further subdivided into three groups according to the pathologic observations (those with acute and gangrenous appendicitis, those with perforation and peritonitis and those with appendical abscesses).

In the first group (297 children) there were 3 deaths, a mortality of 1 per cent.

In the group with perforation and peritonitis (190 children) the mortality was reduced during the last five year period from a persistent 21 per cent to 12.6 per cent by the employment of two measures: (1) adequate administration of intravenous fluid and (2) gastric and duodenal lavage by means of the Wangensteen continuous suction apparatus.

There were 105 children in the group with appendical abscesses. Of these, 73 were operated on (with 4 deaths) and 32 were treated conservatively (with no deaths). The average stay in the hospital of those operated on was thirty-three days and of those not operated on thirteen days. Until 1932 practically all those with appendical abscesses were operated on, and since that time the larger percentage have been treated conservatively. The child who is admitted with a history of appendicitis and who has a mass in the abdomen is treated conservatively unless the mass enlarges while under observation and the child's clinical condition grows decidedly worse. We aim to avoid surgical intervention during the period from the third to the seventh day, feeling that the pyogenic membrane surrounding the infection is not strong enough during this time to resist the trauma of an operation. It is disastrous to convert localized into generalized peritonitis.

The mortality during the first five year period for all cases was 10.2 per cent; during the second period, 7.7 per cent, and during the last five year period, from 1931 to 1935, 5.2 per cent. There were 38 deaths in 592 cases, or a mortality of 6.4 per cent, over the fifteen year period.

RICKETS: A METABOLIC STUDY. DR. JESSE R. GERSTLEY and (by invitation) DAVID J. COHN, Ph.D., and GRACE LAWRENCE.

Over a period of six years 40 infants were studied clinically, and on 20 of these infants determinations of calcium and phosphorus intake, output and retention were made. No vitamin D was given. The idea of the experiments was to get down to fundamentals—to see for once what degree of rickets would develop without addition of vitamin D and to learn what effect variations in the formula might have on the metabolism of calcium and phosphorus and the development of clinical rickets.

The results confirmed the general knowledge that the most powerful influence in the prevention of rickets is the summer season. No matter what formula was used, no baby acquired rickets during the summer.

Diet did have a definite effect on the metabolism of calcium and phosphorus and on the incidence of clinical rickets. In fact, the chemical and clinical findings paralleled each other.

Concentrated feedings, high in calories, containing cow's milk in full strength plus an excess of carbohydrate, led to definite rickets.

Undiluted cow's milk with no addition led to rachitic changes during the winter.

The surprising feature of the work was the low incidence of rickets and the mildness of the symptoms in babies receiving diluted cow's milk with addition of carbohydrate even during the winter.

Another interesting observation was that the blood calcium and phosphorus as well as the roentgenographic findings were usually normal even in infants showing a mild degree of rickets.

The study is basically a protest against the excessive use of vitamin D as forced on the medical profession by commercial interests. It calls attention to the fact that the concentrated feedings, high in calories, now so popular, may be a factor in increasing the incidence of rickets and increasing the demand for vitamin D. It offers some evidence in favor of the use of diluted milk, which was so popular during previous decades. It shows that clinical findings are more important than laboratory reports in the diagnosis of mild or beginning rickets.

# Book Reviews

**L'année pédiatrique.** By Robert Broca and Julien Marie. Paper. Price, 32 francs. Pp. 204, with 78 illustrations. Paris: Masson & Cie, 1936.

The year 1936 was the second year of this series. To persons not familiar with the authors' method, one may say that their scheme is to take notable advances made during the year and have the author write a short article on it, in which they collaborate. They are certainly successful this year in their selections. The articles are intensely interesting and well written. The photomicrographs and roentgenograms are also excellent. The subjects discussed are tuberculosis beginning in infancy, congenital cardiac hypertrophy, vomiting in infants caused by air swallowing, and its treatment, pachymeningitis haemorrhagica, heptomegalia, renal rickets, the Volhard function test for the kidneys, migraine in infancy and its abdominal equivalent, recent researches in whooping cough, familial icterus in the new-born, the roentgenologic diagnosis of dilatation of the bronchi, pyloric stenosis, intestinal invagination, sinusitis in infancy, the treatment of diphtheritic angina and the treatment of poliomyelitis. Although this little volume is written in French, illustrations are universal, and any one should be greatly interested in it.

**Manuel de puériculture.** By P. Lereboullet. Paper. Price, 22 francs. Pp. 230, with 56 illustrations. Paris: Masson & Cie, 1936.

This is the second edition of this standard work on the feeding of infants by Professor Lereboullet. He has brought his excellent 1928 edition completely up to date and added some new illustrations. Although written in French, this little book should be valuable to any one in other countries who is interested in the feeding of infants.

# Directory of Pediatric Societies *

## INTERNATIONAL

### International Association of Preventive Pediatrics

President: Professor G. Scheltema, 6a Herreplein, Groningen, Netherlands.
Secretary: Dr. Daniel Oltramare, 15 Rue Lévrier, Geneva, Switzerland.

### International Congress of Pediatrics

President: Prof. Luigi Spolverini, Policlinico Lungo Tevere Melini, 24, Rome, Italy.
Secretary: Professor Vitetti, Rome, Italy.
Place: Rome, Italy. Time: Sept. 27-30, 1937.

American Committee:
Chairman: Dr. Henry F. Helmholz, Mayo Clinic, Rochester, Minn.
Secretary: Dr. L. Emmett Holt Jr., Johns Hopkins Hosp., Baltimore.

Canadian Committee:
Chairman: Dr. H. B. Cushing, 1390 Sherbrooke St., W., Montreal.
Secretary: Dr. H. P. Wright, 1509 Sherbrooke St., W., Montreal.

### International Congress for the Protection of Infancy

Secretary: Prof. G. B. Allaria, Corso Bramante 29, Torino 120, Italy.
Place: Rome, Italy. Time: Oct. 4-8, 1937.

## FOREIGN

### British Paediatric Association

President: Dr. Leonard Findlay, 14 Wimpole St., London, W. 1.
Secretary: Dr. Arthur G. Maitland Jones, 31A Weymouth St., London, W. 1.

### Paediatrický Spolok na Slovensku

President: Dr. A. J. Chura, Lazaretská 6, Bratislava, Czechoslovakia.
Secretary: Dr. S. Limbacher, Dlhá 2, Bratislava, Czechoslovakia.
Place: Pediatric Clinic, University, Bratislava. Time: Six times a year.

### Royal Society of Medicine, Section for the Study of Disease in Children

President: Sir Lancelot Barrington-Ward, 85 Harley St., London, W. 1.
Secretary: Dr. K. H. Tallerman, 122 Harley St., London, W. 1.
Place: 1 Wimpole St., London. Time: Fourth Friday of each month, 4:30 p. m.

### Palestine Jewish Medical Association, Section of Physicians of Children's Diseases

President: Prof. S. Rosenbaum, 26 Bialikstr., Tel Aviv, Palestine.
Secretary: Dr. A. Brünn, 9 Maazestre, Tel Aviv, Palestine.

### Sociedad Cubana de Pediatría

President: Prof. Félix Hurtado Galtés, Carlos III, 7, Havana.
Secretary: Dr. Carlos Hernández Miyares, San Lazaro 370, Havana.
Place: Cátedra de Clínica Infantil, Hospital Mercedes, Havana. Time: Third Thursday of every month.

* Secretaries of societies are requested to furnish the information necessary to make this list complete and to keep it up to date.

## NATIONAL

### American Medical Association, Scientific Assembly, Section on Diseases of Children

Chairman: Dr. Ralph M. Tyson, 255 S. 17th St., Philadelphia.
Secretary: Dr. Albert D. Kaiser, 16 N. Goodman St., Rochester, N. Y.
Place: Atlantic City, N. J. Time: June 7-11, 1937.

### American Academy of Pediatrics

President: Dr. Laurence R. DeBuys, 1417 Delachaise St., New Orleans, La.
Secretary: Dr. C. G. Grulee, 636 Church St., Evanston, Ill.
Place: Waldorf-Astoria Hotel, New York. Time: June 3, 4 and 5, 1937.
Region I. Place: Boston, Mass. Time: Nov. 12-13, 1937.
Region II. Place: New Orleans, La. Time: Nov. 30, Dec. 1-3, 1937.
Region III. Place: Lake Shore Athletic Club, Chicago. Time: Nov. 4-6, 1937.
Region IV. Place: Los Angeles, Calif. Time: October 1937.

### American Hospital Association, Children's Hospital Section

Chairman: Dr. Howard Childs Carpenter, 1805 Spruce St., Philadelphia.
Secretary: Miss Edith F. Bateman, Shriners' Hospital for Crippled Children, St. Louis, Mo.

### American Pediatric Society

President: Dr. Kenneth D. Blackfan, 300 Longwood Ave., Boston.
Secretary-Treasurer: Dr. Hugh McCulloch, 325 N. Euclid St., St. Louis.
Place: The Sagamore, Bolton Landing, New York. Time: June 9-11, 1938.

### Canadian Society for the Study of Diseases of Children

President: Dr. A. P. Hart, 1844 Bloor St., W., Toronto, Ont.
Secretary-Treasurer: Dr. Pearl Summerfeldt, Hospital for Sick Children, Toronto, Ont.

### Society for Pediatric Research

President: Dr. Francis Scott Smyth, University of California Medical School, San Francisco.
Secretary: Dr. A. A. Weech, 3975 Broadway, New York.
Place: Chalfonte-Haddon Hall, Atlantic City, N. J. Time: May 4, 1937.

## SECTIONAL

### North Pacific Pediatric Society

President: Dr. D. M. Dayton, Medical Arts Bldg., Tacoma, Wash.
Secretary: Dr. H. T. Clay, Medical Arts Bldg., Tacoma, Wash.
Place: Portland, Ore. Time: June 1937.

### Southern Medical Association, Section of Pediatrics

Chairman: Dr. Gilbert Levy, 20 S. Dunlap St., Memphis, Tenn.
Secretary: Dr. Hughes Kennedy Jr., Highland Plaza Apts., Birmingham, Ala.

## STATE

### Alabama Pediatric Society

President: Dr. Wallace A. Clyde, Employees' Hospital, Fairfield.
Secretary-Treasurer: Dr. M. G. Neely, Employees' Hospital, Fairfield.
Place: Birmingham. Time: April 19, 1937.

### Arkansas State Pediatric Association

Chairman: Dr. A. C. Kirby, 701 Main St., Little Rock.
Secretary: Dr. Madeline M. Melson, 909 Main St., Little Rock.

### California State Medical Society, Section on Pediatrics

Chairman: Dr. E. Earl Moody, 3780 Wilshire Blvd., Los Angeles.
Secretary: Dr. Hartzel H. Ray, 23 Second Ave., San Mateo.

### Florida State Pediatric Society

President: Dr. Douglas D. Martin, 442 W. Lafayette St., Tampa.
Secretary: Dr. Warren W. Quillian, 227 Avenue Aragon, Miami.
Place: Concurrent with state association meeting at time of convention.

### Georgia Pediatric Society

President: Dr. Roger W. Dickson, 33 Ponce de Leon Ave., N. E., Atlanta.
Secretary-Treasurer: Dr. Don F. Cathcart, 478 Peachtree St., N. E., Atlanta.

### Hezekiah Beardsley Pediatric Club of Connecticut

President: Dr. Howard W. Brayton, 179 Allyn St., Hartford.
Secretary: Dr. Joseph L. Hetzel, 103 N. Main St., Waterbury.

### Indiana State Pediatric Society

President: Dr. Ernest R. Carlo, 2902 Fairfield Ave., Fort Wayne.
Secretary-Treasurer: Dr. Mathew Winters, 23 E. Ohio St., Indianapolis.
Time: Two meetings a year.

### Louisiana State Pediatric Society

President: Dr. Clarence H. Webb, 624 Travis St., Shreveport.
Secretary-Treasurer: Dr. Ruth Aleman, 1407 S. Carrollton Ave., New Orleans.

### Medical Society of State of New York, Section on Pediatrics

Chairman: Dr. George M. Retan, 459 James St., Syracuse.
Secretary: Dr. John D. Craig, 33 E. 61st St., New York.

### Michigan State Medical Society, Pediatric Section

Chairman: Dr. Edgar E. Martmer, 749 David Whitney Bldg., Detroit.
Secretary: Dr. C. R. Dengler, 131 W. Michigan Ave., Jackson.

### Mississippi State Pediatric Society

President: Dr. Harvey F. Garrison, 319 E. Capitol Pl., Jackson.
Secretary-Treasurer: Dr. Guy C. Jarratt, 920 Crawford St., Vicksburg.
Place: To be designated by Society. Time: Yearly.

### Nebraska Pediatric Society

President: Dr. J. A. Henske, 1614 Medical Arts Bldg., Omaha.
Secretary-Treasurer: Dr. J. H. Murphy, 915 Medical Arts Bldg., Omaha.
Place: As announced by committee. Time: Third Thursday of each month from October to June, inclusive. Dinner at 6 p. m.

### North Carolina Pediatric Society

President: Dr. John LaBruce Ward, Arcade Bldg., Asheville.
Secretary: Dr. Lewis Elias, 36 Grove St., Asheville.

### Oklahoma State Pediatric Society

President: Dr. B. H. Nicholson, 301 N. W. Twelfth St., Oklahoma City.
Secretary: Dr. Hugh C. Graham, 1501 S. Baltimore Ave., Tulsa.
Place: Tulsa: Time: May 10-11, 1937.

### Pennsylvania Medical Society, Pediatric Section

Chairman: Dr. Joseph Stokes, Children's Hospital, Philadelphia.
Secretary: Dr. Theodore O. Elterich, 310 Medical Arts Bldg., Pittsburgh.

### South Carolina Pediatric Society

President: Dr. Leland B. Salters, 317 S. Warley St., Florence.
Secretary-Treasurer: Dr. D. Lesesne Smith Jr., 187 Oakland Ave., Spartanburg.

### Tennessee State Pediatric Society

President: Dr. Joe T. Smith, 702 Medical Arts Bldg., Knoxville.
Secretary: Dr. Kinsey M. Buck, 1193 Madison Ave., Memphis.

### Texas Pediatric Society

President: Dr. John G. Young, 3930 McKinney Ave., Dallas.
Secretary-Treasurer: Dr. F. H. Lancaster, 4409 Fannin St., Houston.
Place: Dallas. Time: Fall.

### Virginia Pediatric Society

President: Dr. Basil B. Jones, 1028 W. Franklin St., Richmond.
Secretary: Dr. W. A. McGee, 616 W. Grace St., Richmond.

### West Virginia State Medical Society, Section on Pediatrics

President: Dr. John T. Thornton, 58, 16th St., Wheeling.
Secretary: Dr. Claude L. Holland, 400 Locust Ave., Fairmont.

## LOCAL

### Academy of Medicine of Cleveland, Pediatric Section

Chairman: Dr. J. D. Pilcher, City Hospital, Cleveland.
Secretary: Dr. William M. Champion, 2323 Prospect Ave., Cleveland.
Place: Cleveland Medical Library Bldg. Time: October, December, February and April.

### Academy of Medicine, Toronto, Section of Pediatrics

President: Dr. T. B. Verner, 170 St. George St., Toronto.
Secretary: Dr. D. V. Hutton, 170 St. George St., Toronto.

### Bronx Pediatric Society

President: Dr. Daniel J. Dolan, 420 E. 159th St., New York.
Secretary: Dr. Samuel T. Levethan, 254 E. 184th St., New York.
Place: Concourse Plaza Hotel, 161st St. and Grand Concourse. Time: Every second Wednesday of each month, except June, July, August and September.

### Brooklyn Academy of Pediatrics

President: Dr. Walter D. Ludlum, 1421 Cortelyou Rd., Brooklyn.
Secretary: Dr. John A. Monfort, 861 Carroll St., Brooklyn.
Place: Kings County Medical Society Bldg. Time: Fourth Wednesday of each month, except May, June, July, August and September.

### Central New York Pediatric Club

President: Dr. Frank Vasder Bogert, 111 Union St., Schenectady.
Secretary: Dr. Frank J. Williams, 58 S. Swan St., Albany.
Place: Various cities in New York. Time: Third Thursday of April and September.

### Chicago Pediatric Society

President: Dr. Robert Black, Del Prado Hotel, Chicago.
Secretary: Dr. James H. Wallace, 715 Lake St., Oak Park, Ill.
Place: Children's Memorial Hospital, 710 Fullerton Ave. Time: Third Tuesday of each month, October to May, inclusive.

### Dallas Pediatric Society

President: Dr. John Young, 3930 McKinney Ave., Dallas, Texas.
Secretary-Treasurer: Dr. John E. Ashby, 3622 Fairmount Ave., Dallas, Texas.
Place: Bradford Baby Hospital. Time: 1 p. m., second and fourth Saturdays of each month.

### Detroit Pediatric Society

President: Dr. Edward A. Wishropp, 10 Peterboro St., Detroit.
Secretary: Dr. W. J. Scott, 5140 Second Ave., Detroit.
Place: Wayne County Medical Society. Time: 8:30 p. m., first Wednesday of each month from October to June, inclusive.

### Fulton County Medical Society, Pediatric Section (Atlanta, Ga.)

Chairman: Dr. Joseph Yampolsky, 478 Peachtree St., Atlanta.
Secretary: Dr. T. I. Willingham, 384 Peachtree St., Atlanta.
Place: Academy of Medicine, 38 Prescott St., N. E. Time: Second Thursday of each month from October to April, 8 p. m.

### Houston Pediatric Society

President: Dr. Walter F. Qualtrough, 920 Westheimer Ave., Houston, Texas.
Secretary-Treasurer: Dr. Allan Bloxsom, 4402 Travis St., Houston, Texas.
Place: Houston Club. Time: Third Monday of each month.

### Intermountain Pediatric Society

President: Dr. Eugene Smith, 385 Twenty-Fourth St., Ogden, Utah.
Secretary-Treasurer: Dr. W. C. Cheney, 837 Boston Bldg., Salt Lake City, Utah.
Place: Salt Lake City, General Hospital. Time: First Thursday of each month, 8 p. m.

### Kansas City (Missouri) Pediatric Society

President: Dr. W. R. Moore, 620 Francis St., St. Joseph.
Secretary: Dr. F. S. Hogue, 1103 Grand Ave., Kansas City.
Place: Kansas City General Hospital. Time: On call.

### Los Angeles County Medical Association, Pediatric Section

President: Dr. Edwin F. Patton, 3875 Wilshire Blvd., Los Angeles.
Secretary-Treasurer: Dr. Henry F. Gallagher, 1930 Wilshire Blvd., Los Angeles.
Place: Los Angeles County Medical Headquarters, 1925 Wilshire Blvd.
Time: Second Monday of February, April, June, October and December.

### Medical Society of the County of Kings and the Academy of Medicine of Brooklyn, Pediatric Section

President: Dr. Harry R. Litchfield, 163 Eastern Parkway, Brooklyn.
Secretary: Dr. Jacob Rosenblum, 575 Ocean Ave., Brooklyn.
Place: 1313 Bedford Ave., Brooklyn. Time: Third Wednesday of each month, October to May.

MEDICAL SOCIETY OF THE COUNTY OF QUEENS, INC., SECTION ON PEDIATRICS

Chairman: Dr. W. C. A. Steffen, 42 Union St., Flushing, N. Y.
Secretary-Treasurer: Dr. Edith A. Mittell, 144, 38th Ave., Flushing, N. Y.
Place: Queens County Medical Bldg., Forest Hills, N. Y. Time: Third Monday of October, January, March and May.

MEMPHIS PEDIATRIC SOCIETY

President: Dr. Clyde V. Croswell, 1052 Madison Ave., Memphis, Tenn.
Secretary-Treasurer: Dr. David W. Goltman, 1073 Madison Ave., Memphis, Tenn.
Place: John Gaston Hospital. Time: Quarterly.

MILWAUKEE PEDIATRIC SOCIETY

President: Dr. George F. Kelly, 425 E. Wisconsin St., Milwaukee.
Secretary: Dr. Helen Jane Zillmer, 781 N. Jefferson St., Milwaukee.
Place: Children's Hospital. Time: Second Wednesday of each alternate month, beginning with February.

NEW ENGLAND PEDIATRIC SOCIETY

President: Dr. Henry E. Utter, 122 Waterman St., Providence, R. I.
Secretary-Treasurer: Dr. Henry E. Gallup, 1101 Beacon St., Brookline, Mass.
Place: Boston Medical Library. Time: Four meetings a year, occurring from September to May.

NEW YORK ACADEMY OF MEDICINE, SECTION OF PEDIATRICS

Chairman: Dr. Alexander T. Martin, 107 E. 85th St., New York.
Secretary: Dr. Philip M. Stimson, 25 Claremont Ave., New York.
Place: New York Academy of Medicine, 2 E. 103d St. Time: Second Thursday of each month from October to May, inclusive, 8:30 p. m.

NORTHWESTERN PEDIATRIC SOCIETY

President: Dr. A. V. Stoesser, University Hospital, Minneapolis.
Secretary: Dr. Roger L. J. Kennedy, Mayo Clinic, Rochester, Minn.
Place: Minneapolis, St. Paul, Duluth and Rochester. Time: January, April, July and October.

OKLAHOMA CITY PEDIATRIC SOCIETY

President: Dr. A. L. Salomon, 1200 N. Walker St., Oklahoma City.
Secretary: Dr. G. R. Felts, 1200 N. Walker St., Oklahoma City.
Time: Alternate months.

PHILADELPHIA PEDIATRIC SOCIETY

President: Dr. Emily Bacon, 2104 Spruce St., Philadelphia.
Secretary: Dr. James E. Bowman, 4091 Comly St., Philadelphia.
Place: College of Physicians, 19 S. 22d St. Time: Second Tuesday of each month from October to June, inclusive.

PITTSBURGH PEDIATRIC SOCIETY

President: Dr. James LeRoy Foster, Highland Bldg., Pittsburgh.
Secretary-Treasurer: Dr. E. R. McClusky, 3200 Fifth Ave., Pittsburgh.
Place: Pittsburgh Academy of Medicine. Time: Second Friday, alternate months from October to April, inclusive.

### Richmond Pediatric Society

President: Dr. Lee E. Sutton, Jr., 2601 Grove Ave., Richmond, Va.
Secretary-Treasurer: Dr. Louise Fry Galvin, 2416 Stuart Ave., Richmond, Va.
Place: Richmond Academy of Medicine, 1200 E. Clay St. Time: First Thursday of each month (except July, August and September).

### Rochester Pediatric Society

President: Dr. F. W. Bush, 29 N. Goodman St., Rochester, N. Y.
Secretary: Dr. David Wolin, 16 N. Goodman St., Rochester, N. Y.
Place: Arranged by program committee. Time: Second Friday of each month.

### Rocky Mountain Pediatric Society

President: Dr. James E. Russell Jr., 820 Metropolitan Bldg., Denver.
Secretary: Dr. F. Craig Johnson, 1850 Gilpin St., Denver.
Place: Children's Hospital, Denver. Time: First Saturday of each month from September to May, inclusive, 2:30 p. m.

### St. Louis Pediatric Society

President: Dr. John Zahorsky, 536 N. Taylor Ave., St. Louis.
Secretary-Treasurer: Dr. Max Deutch, 634 N. Grand Blvd., St. Louis.
Place: St. Louis Medical Society. Time: Third Friday of every month.

### Seattle Pediatric Society

President: Dr. Frank H. Douglass, Medical Dental Bldg., Seattle.
Secretary: Dr. C. Lu Verne Smith, Stimson Bldg., Seattle.
Place: College Club. Time: Third Friday of each month, 6:30 p. m.

### Southwestern Pediatric Society

President: Dr. Howard R. Cooder, 3875 Wilshire Blvd., Los Angeles.
Secretary: Dr. Philip E. Rothman, 3875 Wilshire Blvd., Los Angeles.
Place: University Club of Los Angeles. Time: First Wednesday in January, March, May September and November.

### University of Michigan Pediatric and Infectious Disease Society

President: Dr. M. Cooperstock, Northern Michigan Children's Clinic, Marquette.
Secretary: Dr. D. Murray Cowie, University of Michigan, Ann Arbor, Mich.

### Westchester County Medical Society, Pediatric Section (New York)

President: Dr. Louis V. Waldron, 149 N. Broadway, Yonkers, N. Y.
Secretary-Treasurer: Dr. Fairfax Hall, 421 Huguenot St., New Rochelle, N. Y.
Place: Grasslands Hospital. Time: Third Thursday, October, December, February and April.

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